

Accounting and Business Research

**The demand for the audit in small companies
in the UK**

Earnings management and deferred tax

**The effects of the auditor's professional qualification
and the firm's financial health on depreciation
in Finland**

**Accounting and management discourse in
proto-industrial settings: the Venice Arsenal
in the turn of the 16th century**

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The demand for the audit in small companies in the UK

Jill Collis, Robin Jarvis and Len Skerratt*

Abstract—A recent development of the big GAAP/little GAAP debate in the UK was the proposal to raise the audit exemption thresholds for small companies to EC levels. This paper is based on a survey of the directors of 385 companies conforming to the EC definition of 'small'. The study investigates whether the three size criteria in company legislation (turnover, balance sheet total and number of employees) are appropriate and sufficient proxies for the demand for the audit by developing and testing a number of theoretical models. The results found that 63% of companies would choose to have their accounts audited if they were exempt, which suggests that the majority of those affected by the proposed increase consider the benefits outweigh the costs. It was found that turnover alone could represent size, but that size was less important than the directors' perceptions of the value of the audit in terms of improving the quality of information and providing a check on internal records. Agency relationships with owners and lenders were also found to be significant influences on the demand for the audit in companies of the size studied.

1. Introduction

Since the 1990s, an escalation of the big GAAP/little GAAP debate in the UK has resulted in a number of financial reporting concessions for qualifying smaller entities. In 1994 the EC Fourth Directive permitted national governments to dispense with the requirement for small companies to undergo a statutory audit. This led to an amendment of section 249A of the Companies Act 1985 (SI 1994/1935) that allowed exemption for most companies with a turnover of up to £90,000 and a balance sheet total not exceeding £1.4m. If the company had a turnover of between £90,000 and £350,000, it was able to dispense with the audit, but had to have an accountant's report. However, these concessions could not be taken up if an audit was required by at least 10% of the total number of shareholders. In 1997 the turnover threshold was raised from £90,000 to £350,000 (SI 1997/936), with the balance sheet total remaining at £1.4m. In addition, the company had to qualify as 'small' for the purposes of filing abbreviated accounts.¹ The next change was in 2000 when the turnover threshold for audit exemption was raised to £1m (SI 2000/1430). This was still considerably lower than the turnover threshold that applies to the other concessions offered by little GAAP.

The most recent developments have taken place as a result of a long-term review of core company law. One of the key issues raised by the independent Steering Group is that company law should recognise that the vast majority of companies are small or medium and adopt a 'think small first' approach (DTI, 1999a). While recognising that there are benefits attached to having the accounts audited, the rationale for increasing the number of exempt companies is to relieve unnecessary cost burdens and in 2002 a government White Paper announced further changes (DTI, 2002). These include raising the thresholds for defining a 'small' company to the EC maxima. At that time these were: turnover £4.8m; total assets £2.4m; and employees 50.² In a radical departure from previous practice, it was proposed that the higher EC maxima should be applied to qualification for audit exemption as well as the other concessions offered under little GAAP.

The current debate is informed by a small number of somewhat dated studies, some recent but unrepresentative studies, together with a large amount of anecdotal evidence from the regulators and the accounting profession. Although previous research shows that the directors of small companies themselves are the main users of the statutory

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¹ The options set out in Section 246 of the Companies Act 1985 (as revised by SI 1997/220) allow small and medium-sized companies to prepare and file either full or abbreviated financial statements with the Registrar, but they must provide full financial statements for their shareholders.

² In most EU countries the threshold is substantially higher than in the UK, but there are also legal and regulatory differences, as well as variations in the company populations and size distributions. These factors make inter-country comparisons of small companies problematic.

accounts in the UK and Ireland (Page, 1984; Carsberg et al., 1985; Barker and Noonan, 1996), to a large extent management's views have been ignored in the UK literature. Some information is available from an Australian survey that examined audit demand by 186 family businesses, which were operating in an environment where external auditing was not a statutory requirement (Carey et al., 2000). However, a potential weakness of this study is that the respondents may not have had any experience of the benefits of the audit. In contrast, the present research investigates the views of the directors of companies, the vast majority of which were subject to the statutory audit, but would have a choice if the turnover threshold were increased to the higher EC levels, as proposed.³ It is based on analysis of data drawn from a large questionnaire survey that was funded by the ICAEW (Collis and Jarvis, 2000), which covered a range of little GAAP issues. The purpose of this paper is to examine the appropriateness and sufficiency of the size criteria used in company legislation for measuring the net benefits of the audit to small companies. Therefore, it contributes to an important aspect of the little GAAP debate in the UK.

The remainder of the paper is organised as follows. The next section outlines previous research and theory that relates to the demand for an external audit of small company accounts, with a focus on the UK literature, and develops a number of hypotheses.⁴ This is followed by a description of the research methods and the variables used in the analysis. The final section presents the results and conclusions.

2. Previous research

2.1 Main users of the accounts

An important contribution to the big GAAP/little GAAP literature in the 1980s was a survey by Page (1984), which formed the basis for interviews with directors and their auditors by Carsberg et al. (1985). These studies established that the main users of the accounts of small companies are the directors themselves and that lenders are also an important user group. This body of research has been supported by further empirical work with auditors in Ireland by Barker and Noonan (1996), yet little generalisable research has been conducted with the directors of small companies since audit exemptions were introduced in the UK in 1994. The following review of the literature summarises the current state of knowledge in relation to the costs and benefits of the small company audit from a number of theoretical perspectives.

2.2. Cost-benefit factors

The government's use of certain size criteria in the audit legislation implies that a relationship exists between these measures and the relative costs

and benefits of the audit. Furthermore, there is an assumption in the legislation that the level at which the exemption threshold is set is where the costs of the audit no longer outweigh the benefits. Previous research does not appear to have tested this hypothesis.

In 1979, Page (1984) conducted a postal questionnaire survey of the directors of 413 companies. His study was conducted prior to the Companies Act 1981, which introduced a three-tier size classification of companies⁵ and the option for small companies to file 'modified accounts', and his sample was selected across the complete size range of active, independent companies. His results suggested that 15% of respondents would dispense with the audit if the statutory requirement were removed, but it must be remembered that the study did not focus solely on small companies, which precludes comparison with actual take up by eligible small companies in 1994, some 15 years' later.

Details of the number of companies that did take advantage of exemption in the early years are not available, but some five years after its introduction, the DTI estimated that around 50% of eligible companies below the £350,000 threshold were no longer having an audit (DTI, 1999b:6). A MORI telephone survey of 176 companies (ACCA, 1998) forecast that approximately 40% of companies with a turnover of between £350,000 and £1.5m were likely to opt for audit exemption if the threshold were raised to £1.5m.

The profession's views on the most appropriate level for audit exemption are diverse (see for example, Acher, 1999; Graham, 1999; Langard, 1999; Masters, 1999). In favour of raising the turnover threshold, Mitchell (1999) used his organisation's statistics to argue that '92% of accountants responding to a Small Practitioners Association survey supported exemption for all private, owner-managed, small limited companies' (Mitchell, 1999: 21). On the other hand, Beckerlegge of the ACCA supports maintaining present levels: 'The inescapable fact is that the government's proposals advocate the removal of the audit but not the requirement for the directors to deliver true and fair annual financial statements. Since 90% of the work is done by accountants in the compliance function, it is foolish to take away the value-added aspect which comes with the audit' (Beckerlegge, 1999: 21).

The government contends that for smaller companies, 'regulatory costs have a proportionately

³ At the time the study was conducted, the EC maximum was £4.2m.

⁴ The main focus is on the UK literature, as inter-country comparisons are complicated by differences referred to in footnote 2.

⁵ The three tiers were 'small', 'medium' and 'large'.

higher effect' (DTI, 1999a:1). This is substantiated by a study of 126 companies with a turnover of under £1m, which concluded that 'for many owners of micro companies, the statutory audit fee is an additional cost which appears to bring little benefit, either to themselves or others, and which bites into small profits and scarce management time' (Freedman and Goodwin, 1993: 127).

Although there has been much debate about potential cost savings, little empirical evidence has been collected. Page (1981) found that the majority of auditors responding to his survey (64%) anticipated a reduction in fees of up to 25% if no audit were performed. Pratten (1998) found that the average reduction in fees among the 16 companies he studied was 15%, but this figure does not take account of the additional help sought from the accountant in preparing the accounts. The suggestion that cost savings may be offset by other chargeable work is supported by the MORI survey (ACCA, 1998), which found that most auditors expect to be able to compensate for lost audit fee income from small company clients with a turnover of around £1m. It seems logical to suggest that the higher the cost of the audit, the greater the savings if it were discontinued. In a study of large companies in the US that examined the demand for reviews of quarterly performance prior to filing with the Securities and Exchange Commission (SEC), Ettredge et al. (1994) found that cost savings are a particular incentive in firms with complex activities, such as a large number of business segments, foreign operations or assets tied up in stock and debtors. These characteristics are not likely to be key features of small, private companies.

The lack of consensus in the academic literature and accountancy press on the appropriate level for exemption from the audit in the UK indicates that the size thresholds used in company legislation may not capture adequately the demand for the audit in small companies. This is further demonstrated when agency factors are considered.

2.3. Agency factors

From an agency perspective (Jensen and Meckling, 1976) the demand for audited financial statements arises from information asymmetry, on the assumption that human nature is weak, untrustworthy and in need of some kind of checking (Power, 1997). The agency rationale is classically applied in large companies where there are external shareholders and the audited accounts play an agency role in the relationship between shareholder (the principal) and director (the agent). In small companies, a principal is anyone who is distant from the actions of management and is unable to verify them, such as an external shareholder, lender or other provider of credit. Information asymmetry may also be present amongst internal

shareholders if they lack the necessary skills to interpret financial information (Power, 1997). Thus, demand for the audit from shareholders may not be dependent on size, since 'even in the very smallest company disputes can arise between shareholders and the audited accounts can be an essential protection' (Freedman and Goodwin, 1993: 128).

It can be argued that as small companies are typically family-owned and owner-managed (Bolton, 1971; Carsberg et al., 1985; Collis and Jarvis, 2000) there is little delegation of control, and the risk of internal and external moral hazard is considerably lower than in large companies. This may account for Page's (1984) finding that only 9% of respondents would continue to have their accounts audited principally for the benefit of their shareholders.

Evidence from the small business literature on lending shows that the audited accounts of small firms are crucial in the bank lending decision⁶ (Berry et al., 1987; Berry, Crum and Waring, 1993; Berry et al., 1993; Deakins and Hussain, 1994). Indeed, a telephone survey of 17 bankers in 1998 found that 94% are more willing to lend to small businesses if they have seen audited accounts (ACCA, 1998, Appendix, p.4). From the directors' perspective, the study by Page (1984) suggested that 17% of respondents would continue to have their accounts audited for the benefit of external users such as the bank. Exploratory research following the introduction of audit deregulation in 1994 appeared to corroborate this notion (Lin-Seouw, 2001). More recently, the MORI survey revealed that 82% of companies with a turnover of between £350,000 and £1.5m consider that the information provided within the statutory audit is useful to the bank (ACCA, 1998, Appendix:3).

The level of debt was also tested in the Australian study by Carey et al. (2000), together with size and proxies for the separation of control from ownership. Results from their logistic regression analysis indicated that of these factors, only debt and separation of control from ownership were significant.

An agency justification in connection with lending is supported by a study of the voluntary audit decision made by large quoted US companies in 1926 prior to the audit becoming a statutory requirement (Chow, 1982). The results show that leverage, and to a lesser extent size, were significant factors. In this study, leverage was used as a proxy for the use of accounting numbers in debt covenants, rather than for an agency demand for the accounts to be audited. In contrast, more recent evidence (Ettredge et al., 1994) indicates that leverage is not significant in explaining the de-

⁶ Banks are the main source of finance to small firms (Cosh and Hughes, 1998).

mand for quarterly reviews prior to filing with the SEC. This suggests that leverage is a noisy proxy for the agency demand for the accounts to be audited. This notion is supported by Dichev and Skinner (2002), who report that leverage is used in other studies for a different purpose: namely, the closeness of a company to the constraints specified by the debt covenants.

Simunic and Stein (1987) and Ettredge et al. (1994) contend that agency costs increase in proportion to the size and complexity of the firm's operations. However, such costs are expected to be less significant in small firms where the separation of ownership and control is less marked and operations are less complex than in large firms. Keasey et al. (1988) argue that the cost of the universal application of the requirement to have the accounts audited falls disproportionately on small companies, particularly if the accounts are of little use to external users. This seems logical, as the proportion of fixed costs to variable costs is likely to be greater in small firms compared to large firms, and may be the underlying rationale for the government's assertion that the 'costs of the audit are proportionately greater the smaller the company' (DTI, 1999b:8).

From this review, it would appear that considerable reliance is placed on the audited accounts of small companies in maintaining agency relationships. Yet the government's case for limiting or eliminating the requirement for the small company audit appears to have been motivated solely by the desire to reduce cost burdens.

2.4. Management factors

In addition to cost and agency factors, the demand for external audit may be attributable to management's need for a check on internal controls to reduce the chance of material error. In small companies, the likelihood of a material misstatement arising (inherent risk) and the likelihood of the accounting control detecting any material misstatement (control risk) may be high. Although Carsberg et al. (1985) established that the main use of the statutory accounts is for management purposes, particularly confirmatory purposes, their study did not explore the specific role of the audit in this connection.

The MORI survey (ACCA, 1998) shows that 40% of small companies consider that information provided by the audit is useful to the business itself, which suggests that the directors in such companies have a general perception that there are net benefits to having the accounts audited. Specific reasons for having a voluntary audit identified in the literature include: the efficient running of the company (Page, 1984); because it is a discipline/good practice; for continuity with the past; because they have a profit-related pay scheme; or

because their accountant has advised it (Pratten, 1998). However, there is little generalisable information on management's perceptions of the specific role played by the audit.

In their study of large companies in the US, Ettredge et al. (1994) attempt to make operational the management benefits of audit. They suggest that the purchase of reviews of quarterly performance may be driven by the likelihood of material error. They measure this by the proportion of risky components in the balance sheet, such as stock and debtors, but their results did not provide evidence to accept this hypothesis, as the results for these variables were either not significant or the wrong sign.

2.5. Hypotheses development

There are three significant gaps in the literature regarding the demand for the audit in small companies in the UK. First, there appears to be no empirical evidence on the appropriateness or sufficiency of the government's chosen criteria of turnover, balance sheet total and number of employees for determining audit exemption, nor the specific thresholds. Second, there is a lack of evidence concerning the net benefits of the audit to management. This omission is important, as the directors are the main users of the statutory accounts and those who bear the cost of the audit. Third, it is not known why small companies differ in their choice of whether to retain the audit should it become non-mandatory. In order to test this effectively, it is important to survey companies where the directors have some knowledge and experience of the contribution the audit can make.

The purpose of this paper is to address these deficiencies by focusing on the following research question:

Do the size criteria in audit exemption legislation capture the net benefit of the audit to the directors of small⁷ private companies in the UK?

This question is broken down into a number of theoretical hypotheses, which are presented in the alternate form. The first hypothesis arises from the economic rationale implicit in the audit exemption legislation that the cost of the audit falls disproportionately on small companies:

H1: Ceteris paribus, the likelihood of the directors choosing a non-mandatory audit increases with size, as measured by turnover, balance sheet total and/or employees.

The remaining hypotheses emanate from the contention that the demand for the audit is influenced by agency factors related to information asymmetry and management's beliefs about the

⁷ 'Small' is defined in the next section.

benefits of the audit:

- H2: *Ceteris paribus*, the likelihood of the directors choosing a non-mandatory audit increases if the company has agency relationships with lenders.
- H3: *Ceteris paribus*, the likelihood of the directors choosing a non-mandatory audit increases if there are agency relationships between owners.
- H4: *Ceteris paribus*, the likelihood of the directors choosing to have a non-mandatory audit increases with their belief that the audit acts as a check on internal controls.
- H5: *Ceteris paribus*, the likelihood of the directors choosing to have a non-mandatory audit increases with their belief that the audit increases the quality of the information.
- H6: *Ceteris paribus*, the likelihood of the directors choosing to have a non-mandatory audit increases with their general knowledge of the costs and benefits of the audit.

Thus, the general model for the logistic regression study is expressed as:

Non-mandatory audit demand = f (size, agency costs, perceptions of costs and benefits)

3. Research methods

3.1. Sample selection and data collection

The research took the form of a logistic regression study based on the findings of a postal questionnaire survey. The survey was conducted in 1999 and canvassed the views of the principal directors⁸ of companies classified as 'small' under UK law, as well as larger companies that would be reclassified as such if the thresholds were raised to EC levels as they stood at that time. An initial sample was selected from FAME, which consisted of active, independent⁹ private limited companies that met the following three size criteria in their most recently filed accounts, which represent the 1999 EC maxima:

- turnover up to £4.2m;¹⁰
- balance sheet total of up to £2.1m;
- up to 50 employees.

This produced a list of 11,648 companies from which a systematic random sample was taken by selecting every fifth company. After eliminating 39 companies that were beyond the scope of the study, an effective sample of 2,288 companies was identified.

It should be noted that turnover is available only if the company has filed full accounts and therefore the survey did not canvas the views of directors who had filed abbreviated accounts. However,

this is unlikely to be a major weakness of the study, as filing choice is an issue of disclosure, whereas audit choice is an issue of assurance.

A six-page questionnaire was designed with 33 questions, many of which were multipart. The questions related to different aspects of the use of financial information by the directors. There were three specific questions on the subject of the audit, as well as questions that explored characteristics of the directors and internal and external use of the statutory accounts.

The questionnaire was posted to the principal director, together with an accompanying letter and prepaid envelope in April 1999. After two follow-ups, which Kervin (1992) recommends as the most effective way of increasing response rates, a total of 385 usable replies were received, giving a response rate of 17%. The number of responses is considered sufficient, as it exceeds the minimum acceptable sample size of 384 for a population of 1m or more (Krejcie and Morgan, 1970: 608). In any large survey the problem of non-response bias must be addressed, since not all of those surveyed respond. Previous research (Morgan, 1974; Wallace and Mellor, 1988) suggests that non-respondents behave like late respondents. Tests to look for differences in the characteristics of early respondents and late respondents were not significant, confirming that the two sets were drawn from the same population. This allows the results of the study to be generalised to the population of active, independent private limited companies with a turnover between £0.5m and £4.2m filing full accounts.

3.2. The sample companies

As is the case with small businesses in general, the majority of the sample companies were at the smaller end of the scale: 62% had a turnover of between £0.5m and less than £1m; 49% had total assets of under £0.5m; and 52% had up to 10 employees. Turnover ranged from a minimum of £10,000 to a maximum of £4.2m. The sample was spread across all regions of Great Britain and a wide range of industries.

The companies were also small in terms of the number of owners, with 82% having between one and four shareholders and 66% being wholly

⁸ The questionnaire was addressed to the first named director as provided by FAME, who it was anticipated would be the principal director or one of the principal directors of the company and be in a position to make an informed reply. Indeed, it was found that the majority of the respondents (88%) held the title of managing director, chief executive, company secretary, finance director, etc.

⁹ Subsidiary companies were excluded.

¹⁰ This database contains detailed information taken from the returns made to the Registrar of Companies, but in 1999 was not fully representative of companies with a turnover of less than £0.5m.

family-owned. In 81% of cases the respondent was the principal director. In a further 7% of cases, the respondent was a director, but did not provide a more specific title. More than a third of the respondents (37%) had a first degree or a postgraduate degree and 57% had a professional or vocational qualification.

3.3. Description of the variables

Table 1 presents a summary of the variables included in the analysis, with descriptive statistics provided in Table 2. The data for size variables were obtained from FAME at the time the sample was selected in 1999. All the other variables derive from the questionnaire survey.

NMAUDIT is the dependent variable used in the analysis and captures whether the directors would continue to have their accounts audited if they were not legally required to do. The data is coded 1 if they would continue with the audit and 0 if not (question 12 in the questionnaire). Non-responses and cases where the respondents indicated that they were undecided were excluded.

TOVER, ASSETS and EMPLS are variables that measure the company's turnover and balance sheet total and number of employees respectively and are used to test H1. These variables capture the size criteria used in company legislation and are expected to have a positive influence on the dependent variable and are used to test H1. For the purpose of the analysis, the turnover and balance sheet total data, which was collected in £k, was re-coded as £m.

In this study, size is used as a partial measure of the benefit of the audit and as the sole measure of the cost of audit. However, Chan et al. (1993) found that the audit cost of quoted companies is determined by factors in addition to size. Ettredge et al. (1994) argue that cost is also affected by the complexity of operations, proxied by the number of business segments, the level of foreign operations and the percentage of assets tied up in stock and debtors. The number of business segments and the level of foreign operations are not included, as they are not likely to apply to small companies. The cost of auditing stock and debtors is not included for two reasons. First, it is likely to be affected by the quality of the control systems, rather than the percentage of stock and debtors in the balance sheet. Second, in a small company although the proportion of stock and debtors may be high, the additional costs generated are likely to be quite low in relation to the fixed cost element in the audit fee. A potentially relevant factor that is omitted is the cost of the audit in relation to the size of the company, as opposed to the absolute cost. This is omitted, since the reported audit fee itself is likely to involve substantial error. Small companies often require a considerable amount of accountancy work prior to the auditing of the accounts, which removes the need for some of the audit tests. In such cases, the audit fees reported will include an arbitrary proportion of the preparation costs. This is consistent with Peel and Roberts (2003), who find that the goodness of fit of their audit fee model is substantially lower for compa-

Table 1
Description of variables

<i>Label</i>	<i>Description</i>	<i>Expected sign</i>	<i>Hypothesis tested</i>
NMAUDIT	Whether the company would have a non-mandatory audit (1 = yes, 0 = no)		Dependent variable
TOVER	Size of company as measured by turnover (£m)	+ve	H1
ASSETS	Size of company as measured by balance sheet total (£m)	+ve	H1
EMPLS	Size of company as measured by number of employees	+ve	H1
BANK	Whether the statutory accounts are normally given to the bank (1 = yes, 0 = no)	+ve	H2
FAMILY	Whether the company is wholly family-owned (1 = yes, 0 = no)	-ve	H3
CHECK	Extent of agreement that the audit provides a check on internal books/records (1 = disagree, 5 = agree)	+ve	H4
QUALITY	Extent of agreement that the audit improves the quality of the information (1 = disagree, 5 = agree)	+ve	H5
EDUCATN	Whether the respondent has a degree, a professional/vocational qualification or has studied or received training in business/management subjects or subjects related to the company's activities (1 = yes, 0 = no)	+ve	H6

Table 2
Descriptive statistics

<i>Label</i>	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
NMAUDIT	352	0	1	0.680	0.465
TOVER	385	0.01	4.20	1.131	1.055
ASSETS	385	0.01	2.09	0.706	0.533
EMPLS	385	1	50	14.110	12.515
BANK	382	0	1	0.700	0.460
FAMILY	384	0	1	0.660	0.476
CHECK	366	1	5	4.150	1.092
QUALITY	364	1	5	3.150	1.180
EDUCATN	385	0	1	0.770	0.420

nies with turnover of less than £1m ($R^2 = 0.115$) than for larger groups of companies (R^2 varies between 0.356 and 0.515).

BANK is a dummy variable that is used to test H2. It captures the agency relationship with lenders and is coded 1 if the company normally gives a copy of the annual accounts to the bank/other providers of finance and 0 if not (question 16, fifth variable). It is expected to have a positive influence on the dependent variable.

In a number of previous studies, the bank variable differs from ours. Chow (1982), Ettredge et al. (1994) and Carey et al. (2000) use the debt-equity ratio to capture banking agency costs. In the context of small businesses, however, it is not clear why the likelihood of a company having an external audit would increase linearly with leverage. It seems more likely that when a critical level of leverage is reached, the bank will require the company to have an external audit. Evidence suggests that bank practices vary widely (Dichev and Skinner, 2002) and, therefore, it is difficult to model the unknown and company-specific non-linearity. Furthermore, planned as well as current borrowing is likely to affect the demand for the audit. Therefore, a variable that directly measures whether or not the company provides audited accounts for lenders is employed.

FAMILY is a dummy variable that captures the agency relationship with shareholders and is used to test H3. It is coded 1 if the company is wholly family-owned and 0 if it is partly family-owned or the owners are unrelated (question 5). This variable is expected to have a negative influence on the dependent variable.

CHECK is a management-related variable that captures whether the directors agree with the statement that the audit provides a check on internal books/records and is used to test H4. It is coded on a scale of 1 to 5, where 1 is disagree and 5 is agree (question 11, first variable). This variable is expected to have a positive influence on the demand for the audit.

QUALITY is a management-related variable

that captures whether the directors agree with the statement that the audit improves the quality of the information and is used to test H5. This variable is coded on a scale of 1 to 5, where 1 is disagree and 5 is agree (question 11, fourth variable). It is expected to have a positive influence on the dependent variable.

EDUCATN is a management-related dummy variable that captures the educational profile of the respondent and is used to test H6. It is coded 1 if the respondent has a degree or holds a professional/vocational qualification or has studied/received training in business/management subjects, and 0 if not (questions 29–31). This variable is a proxy for the directors' knowledge of the costs and benefits of the audit and is expected to have a positive influence on the dependent variable.

3.4. Multicollinearity

Multicollinearity, which occurs when the correlation between independent variables in a multiple regression model is high, can give rise to unreliable estimates of the standard errors. This makes it hard to identify the separate effects of the predictors in the analysis (Judge et al., 1985: 896). Therefore, the data was screened to diagnose potential problems among the ordinal and ratio variables using scatter diagrams, which demonstrated modest positive relationships between the ordinal and ratio variables.¹¹ This interpretation is confirmed by the correlation matrix shown in Table 3, which shows that the correlation coefficients are less than 0.7 and indicates that there is no major 'overlap' in the predictive power of the explanatory variables (Kervin, 1992: 608).

4. Results and discussion

4.1. Univariate and bivariate analysis

The key features of the responses to the questions are as follows. The majority of directors

¹¹ As they are dichotomous variables, BANK, FAMILY and EDUCATN are not suitable for this analysis.

Table 3
Correlation matrix of ratio and ordinal independent variables

	ASSETS	EMPLS	TOVER	CHECK	QUALITY
ASSETS	1.000				
EMPLS	0.457*	1.000			
TOVER	0.620*	0.547*	1.000		
CHECK	0.028	0.007	0.075	1.000	
QUALITY	-0.038	-0.082	-0.051	0.434*	1.000

Notes: N = 358

See Table 1 for a description of the variables

* Correlation is significant at the 0.01 level (2-tailed)

Table 4
Mann-Whitney U tests on non-parametric independent variables

<i>Label</i>	<i>Non-mandatory audit (No. of companies)</i>	<i>Mann-Whitney U</i>		<i>Z</i>	<i>p</i>
		Yes	No		
TOVER	241	111	9847.0	-3.978	0.000
ASSETS	241	111	10630.0	-3.095	0.002
EMPLS	241	111	11086.5	-2.584	0.010
CHECK	237	101	7056.5	-6.494	0.000
QUALITY	236	101	7051.5	-6.126	0.000

Note: See Table 1 for a description of the variables

Table 5
Chi-square tests on categorical independent variables

<i>Label</i>	<i>Chi-square</i>	<i>df</i>	<i>P</i>
BANK	5.094	1	0.024
FAMILY	8.193	1	0.004
EDUCATN	9.920	1	0.002

Note: See Table 1 for a description of the variables

(63%) see sufficient benefits in having their accounts audited that they would continue to do so if they became exempt. Of these companies, 86% perceive the audit as a check on internal records; 73% give a copy of their audited accounts to the bank/lenders; 60% are wholly family-owned; and 48% believe it improves the quality of the information in the financial statements. The average turnover of this group of companies was £1.3m. The average turnover of the 29% that stated that they would dispense with the practice was £0.8m.

As the independent variables relating to size

(TOVER, ASSETS and EMPLS) are not normally distributed in small companies, a non-parametric Mann-Whitney *U* test of difference was conducted against the dependent variable (NMAUDIT). A non-parametric test is also required for CHECK and QUALITY, as these two variables are measured on an ordinal scale. The low level of the probability statistic shown in Table 4 indicates a significant difference between the mean ranks of the two sub-samples in the dependent variable and, therefore, these variables are included in the logistic regression.

Table 6
Logistic regression model of the demand for a voluntary audit: size factors

Variable	B	SE	Wald	p
<i>Panel A</i>				
TOVER	0.447	0.128	12.260	0.000
Constant	0.303	0.169	3.227	0.072
<i>Panel B</i>				
ASSETS	0.574	0.230	6.232	0.013
Constant	0.379	0.190	3.954	0.047
<i>Panel C</i>				
EMPLS	0.020	0.010	4.065	0.044
Constant	0.501	0.174	8.336	0.004
<i>Panel D</i>				
TOVER	0.421	0.167	6.384	0.012
ASSETS	0.125	0.281	0.199	0.656
EMPLS	-0.002	0.012	0.018	0.892
Constant	0.266	0.205	1.683	0.195

Notes: N = 385

See Table 1 for a description of the variables

Model summaries:

Panel A Chi-square 14.219, df 1, p < 0.01, -2 Log likelihood 424.590; Pseudo R² 0.056

Panel B Chi-square 6.615, df 1, p < 0.01, -2 Log likelihood 432.194; Pseudo R² 0.026

Panel C Chi-square 4.300, df 1, p < 0.05, -2 Log likelihood 434.509; Pseudo R² 0.017

Panel D Chi-square 14.422, df 3, p < 0.01, -2 Log likelihood 424.387, Pseudo R² 0.056

The remaining independent variables are dichotomous categorical variables. Therefore, a chi-square test was conducted to measure the extent of association between each variable and NMAUDIT. The low probability statistics shown in Table 5 provide evidence of a strong positive association in each case. This means that there is a significant correlation between NMAUDIT and BANK, FAMILY and EDUCATN and these variables are included in the model.

4.2. Multivariate results

4.2.1. Size factors as an explanation for the demand for a voluntary external audit

The first logistic regression model was developed to test the hypothesis that the likelihood of the directors choosing a non-mandatory audit increases with the size of the company as measured by turnover, balance sheet total and number of employees respectively (H1). The purpose of the analysis was to investigate the adequacy of the three size criteria used in company legislation to capture the cost versus the benefits of the audit. Table 6 shows the results of the individual results for each measure of size as the explanatory variable in panels A – C. In each case, there is a significant association with the demand for a non-mandatory audit. Thus, the larger the company according to any one of the three size criteria used in the legislation, the more likely it is that the

directors will choose to have the company's accounts audited and this provides evidence in support of H1. However, panel D reveals that when all the size measures are entered into the regression model together, only TOVER is significant. This demonstrates that turnover by itself captures the cost-benefits of the audit and that the other two size variables do not add significant information and could be excluded as criteria in the audit regulations.

One of the problems with multicollinearity is that coefficient estimates are unstable from sample to sample. Therefore, in addition to examining the correlation coefficients in Table 3, a second check was conducted by partitioning the sample into quintiles according to turnover. The equation in Panel D was estimated again, with a different quintile being removed in turn. The results still show that TOVER is significant, whereas the other measures of size are not.¹²

4.2.2. Other factors explaining the demand for a voluntary external audit

It is important to consider what other factors, apart from relative cost, might contribute to the demand for the audit in small companies. Therefore, a second logistic regression model was developed to test H1 – H6, using TOVER alone as the size

¹² These results are available from the authors.

Table 7
Logistic regression model of the demand for a voluntary audit: net benefits

Variable	B	SE	Wald	p
TOVER	0.333	0.150	4.933	0.026
BANK	0.592	0.301	3.877	0.049
FAMILY	-0.632	0.310	4.152	0.042
CHECK	0.579	0.141	16.762	0.000
QUALITY	0.626	0.142	19.436	0.000
EDUCATN	1.140	0.335	11.552	0.001
Constant	-4.550	0.785	33.614	0.000

Notes: N = 332

See Table 1 for a description of the variables

Model summary:

Chi-square 93.501, df 6, p < 0.01, -2 Log likelihood 311.091, Pseudo R² 0.348

variable. The significant results presented in Table 7 provide evidence to accept H1 – H6.

The general performance of this model is superior to the simple size model shown in Panel D of Table 6. This is demonstrated by the considerably improved goodness of fit (the pseudo R² in Panel D of Table 6 shows that size factors explain 6% of the demand for the audit, whilst the second model in Table 7 explains 35%). This supports the contention that the size alone does not capture the significant features of the demand for the audit in small companies. Indeed, the size variable (TOVER) has considerably less explanatory power than the perceptions of the principal director with regard to the net benefits of the audit (CHECK and QUALITY) and his or her educational profile (EDUCATN). This is demonstrated by the relative values of the Wald test results.

In addition, the results give an important insight into the agency role played by the audited accounts in addressing information asymmetry problems in small companies. First, the significance of BANK demonstrates that the desire for a non-mandatory audit is associated with companies with agency relationships with lenders. This suggests that the cost of the audit in terms of time, money and disruption is an agency cost that is accepted by the directors in order to maintain good relations with lenders. Second, the demand for the audit is associated with companies that are not wholly family owned and the negative sign on the regression coefficient for FAMILY demonstrates this. This seems logical, as the level of trust is likely to be higher among owners who are related and therefore know each other well.

Finally, the analysis reveals that the demand for an external audit is driven by management-related factors: CHECK, QUALITY and EDUCATN, which

relate to the directors' perceptions of the costs and benefits. Two specific benefits are identified: the reduction in inherent risk and control risk provided by the independent check on internal books and records, and an improvement in the quality of the information contained in the statutory accounts.

5. Conclusions

This paper addresses a gap in the literature relating to the factors that affect the demand for the audit by the directors of smaller companies and the findings are generalisable to companies with a turnover between £0.5m and £4.2m filing full accounts. Their views are important as not only do they pay for the audit, but also they are the main users of the statutory accounts. The size of small company that should be exempt from the audit is an important issue in the big GAAP/little GAAP debate and this study both updates and extends previous research. It also adds to our knowledge of the factors that influence the demand for the audit in small companies in the UK.

The purpose of further deregulation of the audit for smaller companies is to relieve cost burdens (DTI, 1999a). However, this study shows that 63% of the sample companies would choose to have a voluntary external audit. This does not support the government's cost rationale, but suggests that the majority of those affected by raising the exemption thresholds to the EC maxima consider the benefits of having their accounts audited outweigh the costs. The analysis in this paper indicates that not only would the directors of companies of the size studied make an active choice on this particular aspect of little GAAP, but that it would be an informed choice. In order of statistical significance, the main factors that predict the demand for

a voluntary audit are:

1. Perceptions of benefits, as measured by the directors considering that the audit improves the quality of the information and/or provides a check on internal records.
2. Education of the principal director, as measured by the principal director having a first or post-graduate degree and/or a professional or vocational qualification and/or having studied or received training in business or management subjects or subjects related to the company's activities.
3. Size, as measured by the company being larger in terms of turnover.
4. Agency relationships between owners, as measured by the company not being wholly family-owned.
5. Agency relationships between the company and lenders, as measured by the directors giving a copy of the audited statutory accounts to the bank or other providers of finance.

These factors account for 35% of the variance in the demand for a non-mandatory audit by the sample companies. These results extend the study by Carey et al. (2000), where the pseudo R^2 is 2%. It also compares favourably with studies of large companies, such as Chow (1982), where the pseudo R^2 is 27%. Nevertheless, other explanations need to be identified.

It seems logical to suggest that in some companies the audit decision will be influenced by their growth strategies, with those aspiring to become large companies being more likely to continue to have the accounts audited. Another factor that is likely to influence the audit decision, and which was not tested in the model, is the cost of the audit and its relation to the size of the company. This is a complex area, as the vast majority (82%) of small companies' statutory accounts are prepared by an external accountant (Collis and Jarvis, 2000) and there is likely to be considerable overlap between preparation costs and the cost of the audit.

It seems likely that the directors' knowledge of the costs and benefits of the audit will be influenced by their accountant's view of the value of the audit to the business. Related to this is the question of eligibility for exemption, which would also require the accountant's advice. If the directors believe that the costs outweigh the benefits, proximity to the threshold may lead them to review their audit policy on an annual basis. These aspects were not examined, but offer fruitful avenues for future research.

A further limitation of the study relates to the reliability of directors' responses when asked to predict their behaviour in connection with the audit choice. The alternative approach is to observe

their actual choices, but this suffers from the drawback that the directors may not have any experience of the benefits of the audit. Future research should be able to establish what proportion of the tranche of companies most recently given exemption (those with a turnover of between £350,000 and £1m) have taken up the option, which would provide directly comparable empirical data for the first time.

One of the main challenges faced by the regulators in developing little GAAP is to provide a regulatory framework that will be applicable to all small companies, at all times over an extensive period and in all circumstances. This involves balancing the consequential choices made by company management with the public interest and perceived burdens. The findings of this study have a number of important implications for accounting theory, as incorporated in UK GAAP. A key finding is that turnover alone could represent size in this aspect of little GAAP. However, size is not a complete measure for capturing the demand for the audit. Indeed, the research shows that size is less important than the directors' perceptions of the value of the audit. The qualitative nature of such factors means that they are harder to incorporate in the legislation than quantitative measures.

The results suggest that while the difference in the needs of small companies compared to those of large companies should be taken into account in little GAAP, the similarities should not be overlooked. The rationale for the external audit of the accounts of large companies is based on the requirement for an independent opinion for the benefit of shareholders, who have appointed the directors to manage the business on their behalf. In small companies, where there is seldom any separation of ownership and control, there is an assumption in GAAP that agency relationships are of little importance. Yet this study reveals two agency relationships. The first is between the company and the bank or other lender. Where this is the case, the removal of the statutory audit requirement will not prevent companies with borrowings from continuing to have their accounts audited to satisfy the needs of the lender, as market forces influence this decision. The second situation arises among shareholders in companies that are not entirely family-owned, where there is a case for continuing to provide a statutory requirement for the audit if 10% of shareholders require it. This will cover the needs of external shareholders in small companies, who are not involved in the day-to-day running of the business and require assurance for the same reasons as their counterparts in large companies. It will also meet the needs of owner-managers of small companies that are not wholly family-owned, where the independent assurance provided by the audit is also required.

Appendix**Extract of questionnaire showing variables analysed**

- Q2.** How many shareholders (owners) does the company have?
- Q5.** Would you describe the company as a family-owned business? (Tick one box only)
- Family-owned (first generation) (1)
- Family-owned (subsequent generation) (2)
- Partly family owned (3)
- Owners are not related (4)
- Q11.** What is your view on the following statements regarding the audit? (Circle the number closest to your view)

	Agree		Disagree	
Provides a check on internal books/records	5	4	3	2
Shifts responsibility from the auditors to the directors	5	4	3	2
Helps protect against fraud	5	4	3	2
Improves quality of the information	5	4	3	2
Improves credibility of the information	5	4	3	2
Shows compliance with legislation	5	4	3	2
Other (please state)	5	4	3	2

- Q12.** Would you continue to have your company's accounts audited if not legally required to do so? (Tick one box only)

Yes (please give your reasons)

No (please give your reasons)

Undecided (1)
Would take professional advice (2)

- Q16.** Apart from the Registrar of Companies, who normally receives a copy of the annual accounts?

	(1) Abbreviated Statutory accounts	(2) Full statutory accounts	(3) Additional detailed accounts
All employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Directors who are shareholders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Directors who are <i>not</i> shareholders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Senior managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bank/other providers of finance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Major suppliers/creditors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Major customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inland Revenue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anyone else? (please state)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q28. What is your position in the company? (Tick one box only)

Managing director/Chief executive

 (1)

Finance director

 (2)

Other (please state)

Q29. What is your highest educational qualification? (Tick one box only)

First degree

 (1)

Postgraduate degree

 (2)

None of these

 (3)**Q30. Do you hold a professional or a vocational qualification?**

Yes

 (1)

No

 (0)**Q31. Have you studied or received training in business or management subjects, or subjects related to the company's activities? (Tick one box only)**

Business/management subjects

 (1)

Subjects related to company's activities

 (2)

None of these

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Earnings management and deferred tax

Kevin Holland and Richard H. G. Jackson*

Abstract—This study analyses the deferred tax provisions of firms during a period in which the firms' incentive to manage earnings may have been particularly strong and in which firms made disclosures in relation to partial deferred tax provisions which revealed readily their under- or over-provision of deferred tax. Using a sample of 58 firms for the two years 1991 and 1992, the magnitude of the under- or over-provisions found is economically significant, amounting, on average, to around 20% of the maximum potential deferred tax liability and, more important, 9% of profit or loss before tax. This paper takes such under- and over-provision of deferred tax and investigates its relationship with a number of posited explanatory variables – as derived and developed from the earnings management literature. In a multivariate setting it is found that the level of under-/over-provision is related to the following characteristics: whether the firm is reporting a pre-tax loss or a pre-tax profit; the extent of adjustment to prior year tax; and the level of surplus advance corporation tax (ACT). These findings support a general profit-smoothing hypothesis, and the finding in relation to ACT suggests that firms take an overall view in determining the required level of provision in order to manage earnings, rather than concentrating upon particular line items. There is also weaker evidence of a relationship between the level of under-/over-provision and firms' levels of gearing and effective tax rates.

1. Introduction

While recent disclosures concerning Enron and WorldCom provide stark evidence of the ability and willingness of managers to manipulate or mis-state financial accounting items, the academic literature has not, until recently, shown earnings management to have had a significant effect on reported earnings (Dechow and Skinner, 2000). This failing has been attributed in part to methodological issues and also to a lack of focus on capital market incentives to manage earnings.

This paper makes three main contributions to the literature, using data for UK firms. First, in employing a novel methodology, the results have the potential to corroborate and strengthen findings based on existing methodology. Second, the paper investigates earnings management by focussing upon deferred tax provisioning – an area of financial accounting practice which is both relatively

complex and highly subjective, and in which, therefore, the opportunity to manage earnings is correspondingly heightened. Although the current UK financial reporting standard covering deferred taxation, *Financial Reporting Standard 19: Deferred Tax*¹ (FRS19) allows some discretion in arriving at the required deferred tax provision, the latitude now permissible is considerably less than that which was previously available under *Statement of Standard Accounting Practice 15: Accounting for Deferred Tax*² (SSAP15) – the provisions of which set the UK apart as a rare jurisdiction in which partial provisioning was widely used.³ Consequently, the paper focuses on provisions made under SSAP15. The paper's third main contribution derives from the particular setting adopted, which allows for the testing of new hypotheses relating to earnings management and the influence of tax reporting considerations that are still relevant post SSAP15.

The research design utilises information from published financial statements in order to identify the occurrence and extent of under- and over-providing for deferred taxation. At any point there may be a difference between the amount of the deferred tax provision as computed on the basis of partial provision, and the 'maximum potential pro-

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¹ FRS19, Accounting Standards Board. Issued December 2000, effective in respect of years ending on or after 23 January 2002.

² SSAP15, Accounting Standards Committee, adopted by the Accounting Standards Board. Issued October 1978, revised May 1985, amended October and December 1992.

³ In contrast, for example, to the position in the United States, Japan, Australia, France, Germany, Italy and Canada (Choi, 1991); and in contrast, additionally, to the position in the Netherlands and Sweden (Archer et al., 1995).

vision' (i.e., computed on the full provision basis) – this difference being the so-called amount of 'unprovided' deferred tax. Under four assumptions (which are discussed in the later section upon research design and hypotheses), the unprovided deferred tax as at the beginning of the forecasting period should equal the maximum potential deferred liability subsequently disclosed at the end of the forecasting period. The Appendix demonstrates this relationship numerically.⁴ Any excess (deficit) of unprovided deferred tax as at the beginning of the forecasting period over (under) the maximum potential deferred tax liability subsequently disclosed at the end of the forecasting period can be interpreted as an under-provision (over-provision) as at the beginning of the forecasting period. Thus, the researcher may derive a measure of under/over-provision from publicly available information. The paper links such under/over-provision with incentives to manage earnings, whilst recognising (and controlling for) the possibility that under/over-provisioning may, to some extent, result from forecasting error independent of earnings management. The relationship of under/over-provisioning with a number of firm-specific variables, posited to be indicative of propensity to manage earnings, is investigated – the variables employed being a combination of those used in previous studies and a number developed in the context of this paper.

The analysis finds that the majority of firms over-provided for deferred tax during the period under review, on average by 9% of pre-tax profits in 1991, 8% in 1992. Of the sub-sample of firms which under-provided, the amounts of under-provision represented 9% and 52% of pre-tax profits. Drawing correct inferences concerning earnings management incentives depends upon controlling for forecasting difficulty, and upon the appropriateness of the proxy employed in this respect. The choice of this proxy is considered in detail under Section 3.2. Having controlled for variation in the predictability of firms' earnings, a proxy for forecasting difficulty, relationships between the level of under- and over-provision and the following factors, consistent with an earnings management motivation, are found: whether the company reports a pre-tax profit or a pre-tax loss; the level of adjustment to prior year tax; and the level of surplus advance corporation tax (ACT). There is also weaker evidence of gearing and relative effective tax rate burdens being associated with the level of under/over-provision.

The remainder of the paper proceeds as follows: the next section covers prior research and accounting for deferred tax; the third section sets out the research design and hypotheses; the fourth section presents and discusses results; and the final section summarises and concludes.

2. Prior research and accounting for deferred taxation

This section contains a discussion of the extant literature upon earnings management in general; a discussion of the literature upon earnings management and deferred tax; and a summary of the financial accounting and reporting requirements in respect of deferred tax. The discussion of the general earnings management literature focuses on two issues: first, it summarises contrasting approaches to the detection and quantification of earnings management, and motivates the approach adopted in this paper; and second, it sets out the various settings and motivations for earnings management which have been examined in recent research, thereby providing a context for the development of hypotheses in the next section.

2.1. Methodological approaches in the study of earnings management

Three distinct approaches are seen within the earnings management literature (McNichols, 2000).⁵ Initial studies focused on decomposing observed total accruals⁶ into their non-discretionary (unmanaged) and discretionary (managed) elements. Most studies in this area are related to the Jones (1991) time-series model,⁷ which, despite its popularity, has methodological limitations. Dechow et al. (1995) evaluate various models including the Jones and modified Jones models. Although all the models they considered produce reasonably well-specified tests, the authors conclude that the power of the tests is relatively low. Similarly, Young (1999) assessed the relative performance of a number of alternative models and concluded that the level of measurement error in decomposing total accruals is significant.⁸ Testing

⁴ The Appendix uses the example of accelerated capital allowances, but the relationship demonstrated holds for a wider variety (and mix) of timing differences.

⁵ In the light of recent extensive surveys and discussions of the earnings management literature, this section focuses only on those studies relevant to the approach adopted in this paper. Readers requiring a wider discussion of research design issues are referred to Dechow and Skinner (2000), McNichols (2000) and Beaver (2002).

⁶ The definition of total accruals, varying across a range of studies, has included all of the following: total accruals including or excluding depreciation; total accruals including or excluding long term accruals; and working capital accruals.

⁷ The basic methodology is to regress a measure of total accruals as dependent variable upon independent variables designed to control for non-discretionary income/expense items, thereby allowing extraction of a measure of discretionary accruals. Developments of this method include cross-sectional and time series approaches.

⁸ Young (1999) also tests a number of suggestions for improving specification, including the use of additional regressors to control for sources of non-discretionary accruals, e.g., cash-flow growth, fixed asset intensity and average fixed asset life.

various models in a cross-sectional form, Peasnell et al. (2000a) corroborate US findings regarding model specification. They conclude, in addition, that the most appropriate model in terms of power is setting specific.

Partly in response to the foregoing general concerns, a second approach has developed in which investigation is focused upon specific line items rather than on examination of total accruals.⁹ In focusing on specific profit and loss items which, by design, are those of the more subjective areas of income determination, this second approach provides a setting in which the expectation of detection of earnings management is higher. This approach has the additional advantage that, in using item-specific variables, the precision with which the unmanaged or non-discretionary variables are measured is increased (Beaver, 2002). The variety of profit and loss items examined by this approach is discussed in the next sub-section. The approach, however, albeit focused on the more subjective areas of financial reporting, does not of itself necessarily result in examination of settings where incentives to manage earnings are the strongest.

A third approach addresses this concern by concentrating upon settings where *ex ante* there appear to be strong incentives to meet 'critical' or 'target' earnings figures. This approach is motivated by the belief that clearer insights concerning incentives to manage earnings will be obtained by examining firms' behaviour in particular contexts. The influence of capital markets on firms' performance and, increasingly, on levels of managerial remuneration provides settings where strong incentives to manage earnings may be anticipated (Dechow and Skinner, 2000). Studies in this area adopt a common approach in focusing on the distribution of earnings around a target level of profit, whether that target be the previous period's level of profit, zero profit, or the level of analysts' forecasts. The research is based on an expectation, absent earnings management, of unbiased distributions of firm-reported profits around any particular level of earnings. Consequently, the method is not dependent upon first distilling non-discretionary from total accruals. It does not, however, offer insights concerning the mechanisms by which the desired level of earnings is achieved.

2.2. Settings for study of earnings management

Investigation was initially upon incentives to manage earnings as implied by the costly contracting literature (Watts and Zimmerman, 1978).¹⁰ The focus of these studies is upon contractual settings between firms' managers and suppliers of debt (leverage hypothesis), and between managers and shareholders in respect of the supply of management services (bonus plan hypothesis); and also upon the implicit and explicit contracts between

firms' managers and the state (size hypothesis). While early hypotheses centred on accounting policy choice, subsequent work investigated earnings management within a given set of accounting policies. For example, evidence of earnings management has been detected in the following settings (or with the following motivations): high leverage and close proximity to debt covenant violations (DeFond and Jiambalvo, 1994); to increase accounting based management compensation (Guidry et al., 1999); and circumvention or reduction in the impact of regulation (Collins et al., 1995).

The specific line items which have been examined include bank loan provisions (Liu et al., 1997), insurers' claim loss provisions (Beaver and McNichols, 1998) and deferred tax valuation allowances (Visvanathan, 1998, Miller and Skinner, 1998, and Bauman et al., 2001).¹¹ In the UK, a recent paper upon the valuation relevance of partial provisioning finds evidence which is indicative of earnings management and calls for further research upon this issue (Citron, 2001). This view is supported by anecdotal UK evidence found in Curtis (1995), which posits the deferred tax provision as being determined in order to achieve a desired effective tax rate.

Studies based on capital market incentives have found evidence of earnings management which appears to be motivated by firms attempting to avoid reporting a loss or a year on year earnings decline (Burgstahler and Dichev, 1997, and Burgstahler, 1997); mitigating the extent of extreme financial performance (Guay et al., 1996); smoothing around a target income figure (DeFond and Park, 1997, and Young, 1998); attempting to meet market expectations as proxied by analysts' forecasts¹² (Degeorge et al., 1999); and increasing earnings in anticipation of a share issue (Rangan, 1998, and Teoh et al., 1998). While the evidence appears compelling, it does not consider the mechanisms by which capital market considerations in-

⁹ While the initial focus on total accruals has been superseded in studies attempting to discover the extent of earnings management, it is still, however, an appropriate vehicle for examining, for example, the moderating role of governance structures, etc. on the level of earnings management (and in which context it would be inappropriate to focus on a single line item or on a limited number of line items). For a discussion of the methodological issues and approaches see Peasnell et al. (2000a).

¹⁰ For a full discussion of the costly contracting based earnings management research see Healy and Wahlen (1999).

¹¹ Since the valuation allowances issue is specific to the US, it is not considered in detail in this paper. For a review of the associated literature see Bauman et al. (2001).

¹² It is a moot point as to what or whom is being managed – earnings or analysts?

fluence firms to managing earnings.

2.3. Accounting for deferred taxation

In the period under review, UK firms were required under the provisions of SSAP15 to provide under the liability method to the extent that it was 'probable that a liability or asset will crystallise' (SSAP15, para. 25).¹³ In determining the required provision, firms were required to net off the various effects of each timing difference and only consider the overall position. The Appendix to the SSAP (SSAP15, Appendix, para. 4) states in general that in estimating likely reversals, the forecasting 'period may be relatively short – say three to five years'. An additional consideration is the SSAP's provisions concerning the interaction between ACT and deferred tax: the deferred tax charge/credit could be influenced by an associated write back/off of ACT

when it is deemed that surplus ACT could be set off against future corporate tax liabilities.¹⁴

SSAP 15 has now been superseded by FRS19. This standard requires, inter alia, that deferred tax be computed on a full provision basis where provision is required,¹⁵ rather than on the partial provision basis formerly required by the SSAP. This prescription as to computation basis would appear, *ceteris paribus*, to be likely to reduce the opportunity for earnings management via the deferred tax charge. Deferred tax, however, remains a relatively complex area of accounting: the new standard allows, indeed requires, firms to form expectations concerning their future, apply judgment and make choices in accounting for deferred tax. The impacts of adoption of FRS19, including any impact upon earnings management via the deferred tax charge, would appear to be an important area for future research.

¹³ As a result, however, of a 1992 amendment relating to pensions and other post-retirement benefits, firms could use the 'same recognition criteria for the deferred tax implication of pensions and other post-retirement benefits as in accounting for those obligations to provide those benefits' (SSAP 15, para. 12A), i.e., use of a full provision basis was an option.

¹⁴ Under the UK imputation system of taxation during the period under review, when a company paid a dividend, advance corporation tax (ACT) equal to the product of the lower rate of income tax and the gross dividend was due to the Inland Revenue. Shareholders received the net dividend, equal to the gross dividend less ACT paid (i.e., a net dividend plus an imputed tax credit, the sum of which equalled the gross dividend). The ACT represented a prepayment of corporation tax by the company, available for offset against the company's assessed corporation tax liability for the period. This offset, however, was limited to the amount of ACT which would have been payable had the company paid a gross dividend equal to its taxable profits for the period. This restriction could lead to firms having 'surplus' ACT for a period, for which the required accounting treatment was either carry forward as a tax asset for relief against future periods' mainstream corporation tax liabilities, if such offset was reasonably expected; or, if the ACT was deemed irrecoverable, write off through the taxation line in the profit and loss account. ACT written off could, however, be written back in subsequent periods if its availability for offset against mainstream corporation tax liability was established. The requirement that ACT be paid in respect of dividend payments by companies was removed with effect from 6 April 1999, although shareholders are still deemed to receive net dividends with an associated tax credit.

¹⁵ The standard is also explicit in its prohibitions as to the types of timing difference upon which deferred tax may not be provided.

¹⁶ Since length of forecasting period, not disclosed in financial statements nor otherwise publicly available, dictates the number of future periods for which expected net timing differences need be considered.

¹⁷ Inevitable in the sense that, given no change in regulation and no further action by the firm, the timing difference in respect of each item will necessarily reverse. For example, reversal of an excess of capital allowances over book depreciation in respect of an asset is inevitable, but crystallisation of a held over gain on an asset is not inevitable (in as much as crystallisation is contingent, *inter alia*, upon sale of the asset).

3. Research design and hypotheses

3.1. Measurement of earnings management under the partial provision basis

Under four assumptions (which follow), the unprovided deferred tax as at any balance sheet date would equal the maximum potential deferred tax at the end of the forecasting period, since the net timing differences assessed at the beginning of the forecasting period as being unlikely to reverse in that period (and only those timing differences) would be left to reverse in subsequent periods. The four assumptions required are: (i) a neutral, bias-free accounting and computation system; (ii) length of forecasting period for deferred tax calculation purposes,¹⁶ (iii) perfect foresight at the beginning of the forecasting period; and (iv) provision be made only in respect of timing differences whose reversal is inevitable,¹⁷ i.e., excluding those related to tax on rolled-over or held-over chargeable gains, tax on potential remittances of overseas income, and trading losses or surplus ACT in excess of the maximum amounts which may be off-set. The fourth assumption may be handled by suitable sample selection. With the first three assumptions and with suitable sample selection, therefore:

$$MP_t - P_t = MP_{t+x} \quad (1)$$

where MP_t and P_t are, respectively, the maximum potential deferred tax and the amount of deferred tax actually provided at time t , and x is the length of the forecasting period. In expression (1), a deferred tax provision (profit and loss account debit, balance sheet credit) is treated as a positive quantity. This convention carries to expressions (2) and (3).

In the real world of potential bias and uncertainty, the amount of deferred tax unprovided at time t in excess of the maximum potential deferred tax as at the end of the forecasting period constitutes an

under-provision of deferred tax at time t (and the reverse would represent an over-provision):

$$\left. \begin{array}{l} MP_t - P_t > MP_{t+x} \Rightarrow \text{underprovision at time } t \\ MP_t - P_t = MP_{t+x} \Rightarrow \text{no under or overprovision at time } t \\ MP_t - P_t < MP_{t+x} \Rightarrow \text{overprovision at time } t \end{array} \right\} \quad (2)$$

In the following analyses the dependent variable, PD_t , (provisioning difference at time t), is under (over) provision expressed as a percentage of the maximum potential deferred tax liability as at time t .¹⁸ This variable must be bounded below by the amount provided expressed as a percentage of the maximum potential deferred tax liability (to ensure that any excess of originating timing differences over reversals during the forecasting period cannot erroneously inflate the measure of over-provision – since such excess cannot be recognised for financial accounting purposes); and there must be control for the possibility that the maximum potential deferred tax at the end of the forecasting period is, in fact, a debit (thereby ensuring that under-provision plus the actual provision at time t is limited by the maximum potential deferred tax liability at time t):

$$PD_{t,x} = \left\{ \begin{array}{ll} \frac{(MP_t - P_t)}{MP_t} \times 100 & \text{if } MP_{t+x} < 0 \\ \frac{-P_t}{MP_t} \times 100 & \text{if } (MP_t - P_t) - MP_{t+x} < -P_t \\ \frac{(MP_t - P_t) - MP_{t+x}}{MP_t} \times 100 & \text{otherwise} \end{array} \right\} \quad (3)$$

The second subscript, x , on PD represents the length of the forecasting period. Increasing positive (negative) values of PD represent higher levels of under (over) provision at time t relative to the maximum potential deferred tax liability at that time.

We also define a mean of this variable over a forecasting period of x years, to generate an alternative, aggregate dependent variable as follows:

$$\overline{PD}_{t,x} = \left(\sum_{j=1}^x PD_{t+j} \right) / x \quad (4)$$

These variables may be computed readily by reference to figures disclosed in published financial statements.

The dependent variable PD ¹⁹ is designed to capture earnings management via deferred taxation. In this context intentionality is key, and the possibility that under/over-provisioning is, to some extent, due to inaccurate forecasting (e.g. of capital expenditure) must be taken into account. The assumption of perfect foresight, therefore, may not be maintained, and we write:

$$PD = EM \pm FE \quad (5)$$

where EM represents the amount of under/over-provisioning due to earnings management, and FE

the amount of under/over-provisioning which results from inaccurate forecasting. In the following analysis, therefore, there must be a control for FE . This is achieved by adoption of a control variable, as discussed in Section 3.2.

3.2. Hypotheses

The following alternative hypotheses are designed to investigate any association between earnings management and a number of posited explanatory variables.²⁰ In each case, a brief explanation of the hypothesised relationship is given, along with a definition of the relevant explanatory variable.²¹ Table 1 summarises these variables, definitions and hypotheses.

Gearing. Reduction of the amount of taxation expensed by under-providing deferred tax would result in an improvement in a firm's apparent ability to service its existing level of debt and its ability to attract additional debt on favourable terms. At extreme levels of gearing, deliberate under providing could avoid the breach of loan covenants. The variable $GEAR$ is defined as the firm's capital gearing ratio.²²

$H_I(A)$: *There is a positive (negative) association between level of gearing and the extent of any under- (over-) provision of deferred tax*

Profitability. A firm might attempt to reduce a pre-tax loss by under-providing deferred tax. When a firm is reporting a pre-tax profit this incentive may not exist, and could be replaced by an incentive to reduce profits (i.e., to smooth profits). The variable $PROFIT$, designed to capture a firm's profit status, is defined as a binary variable to be 1 if the firm's pre-tax profit²³ is positive, 0 otherwise.

$H_I(B)$: *There is a negative (positive) association between profit status and the extent of any under- (over-) provision of deferred tax*

¹⁸ This variable may capture not only earnings management, but also, potentially, lack of perfect foresight at the beginning of the forecasting period. In the analysis which follows, a proxy for lack of perfect foresight and forecasting error is incorporated as a control variable (alternative proxies being employed to test results sensitivity in this respect).

¹⁹ Subscripts omitted for the remainder of Section 3.1.

²⁰ As against the null hypothesis of no relationship in each case.

²¹ For ease of reading, variable names are cited in this section without time subscripts.

²² Datastream item 731.

²³ Datastream item 154.

²⁴ Investors' expectations concerning the level of earnings could be a strong target. It is not possible, however, to formulate a suitable test variable in this respect since the available proxies are based on earnings *after taxation*. See for example, the I/B/E/S definition of earnings per share. A univariate analysis, however, based on the level of under-/over-provision and a measure of the difference between the mean of analysts' EPS forecasts and reported after tax earnings, is reported in the next section.

Table 1
Summary of variables and hypotheses as to relationship between dependent and explanatory variables

	<i>Variable name</i>	<i>Definition</i>	<i>Hypothesised sign</i>
Dependent	$PD_{t,x}$	Under- (over-) provision of deferred tax in year t as a proportion of the maximum potential deferred tax provision in year t , assuming a forecasting period for deferred tax purposes of x years. Five alternative formulations: $x = 1, 2, 3$ and 4 ; and an aggregate formulation, being the arithmetic mean of the variable under the other formulations.	Not applicable
Explanatory (time subscripts omitted)	<i>GEAR</i>	Capital gearing ratio (<i>Datastream</i> item 731)	Positive
	<i>PROFIT</i>	1 if pre-tax profit (<i>Datastream</i> item 154) is positive, 0 otherwise	Negative
	ΔPBT	1 if pre-tax profit (<i>Datastream</i> item 154) is greater than previous period, 0 otherwise	Negative
	<i>ETR</i>	Corporation tax minus double tax relief plus overseas tax (<i>Datastream</i> items 160, 162 and 167 respectively), divided by pre-tax profit (<i>Datastream</i> item 154)	Positive
	<i>PYTC</i>	Adjustment to prior year tax charge (<i>Datastream</i> item 199) divided by maximum potential deferred tax provision (as gathered from copy financial statements)	Negative
	<i>EQUITY</i>	Equity issued for cash plus equity issued for acquisition (<i>Datastream</i> items 412 and 414 respectively), divided by market value of equity at start of period (<i>Datastream</i> item <i>MV</i>)	Positive
	<i>AUD</i>	1 if auditor from 'big six', 0 otherwise	Negative
	<i>SIZE</i>	Natural logarithm of end-of-period market value of equity (<i>Datastream</i> item <i>MV</i>)	Positive or negative
	<i>ACTV</i>	Amount of surplus ACT set off against the period's deferred tax provision as scaled by the maximum potential deferred tax provision (both as gathered from copy financial statements), given positive sign if firm has under-provided deferred tax, negative if firm has over-provided deferred tax	Positive
	<i>UNCERT</i>	Modulus of coefficient of variation in analysts' forecast earnings per share (source: I/B/E/S) during the twelve months preceding results disclosure, given positive sign if firm has under-provided deferred tax, negative if firm has over-provided deferred tax	Positive

Earnings targets. Aside reduction of a post-tax loss, firms may have other desired or target levels of earnings. For example, in order to demonstrate improved performance, the previous period's post-tax profit could be a desired minimum level, and the incentive to manage deferred tax might fall as pre-tax profit over the period increases.²⁴ The variable ΔPBT is defined as a binary variable to be 1 if current pre-tax profit²⁵ is greater than that in the previous period, 0 otherwise.

$H_1(C)$: *There is a negative (positive) association between the direction of annual change in pre-tax profit and the extent of any under-(over-) provision of deferred tax*

²⁴ *Datastream* item 154. The prior literature focuses on prior year post-tax profits as a potential earnings target. Since the focus of this paper, however, is on earnings management via an element of the tax charge, the empirical analysis uses prior year pre-tax profits in order to abstract from tax effects.

Effective tax rate. Managers may attempt to use the level of deferred tax provision to achieve a desired effective tax rate (ETR). Curtis (1995) reports anecdotal evidence that firms 'set the deferred tax provision so as to achieve a desired effective tax rate.' Under-providing deferred tax could be used to mitigate a high ETR,²⁶ or, if an ETR stable over time is desired, under- and over-provision of deferred tax could be used for adjustments. The variable ETR is defined as rate of taxation before deferred taxation and prior year adjustments, i.e., current year tax charge,²⁷ divided by pre-tax profit.²⁸

H_I(D): There is a positive (negative) association between ETR and the extent of any under-(over-) provision of deferred tax

Adjustment to prior year's tax charge. The level of deferred tax provision can be used to mitigate the effect of an adjustment to a prior year's tax charge. The current tax charge included in a profit and loss statement is an estimate and can differ significantly from the finally agreed liability. Where the agreed liability differs from the earlier recorded estimate firms frequently separately disclose the difference by way of an adjustment to the prior year tax charge.²⁹ Relative to earnings management via the profit before tax line, the use of the deferred tax provision to absorb 'tax shocks' in the form of prior year adjustment is low both in cost and risk. The (corporation) tax consequences are zero and the subjective nature of the partial provision method reduces the likelihood of detection and successful challenge by the auditor. Further, this treatment is less visible than adjusting through the current corporation tax charge – where auditors routinely compare the levels of provision with levels of subsequently agreed liabilities. The variable PYTC is defined as adjustment to prior year tax charge³⁰ scaled by the maximum potential deferred tax provision.³¹

H_I(E): There is a positive (negative) association between the magnitude of any adjustment to increase a prior year tax charge and the extent of any under- (over-) provision of deferred tax; and vice-versa in respect of any adjustment to decrease a prior year tax charge

Issuance of equity. Having recently issued equity or intending to do so shortly, a firm may attempt to increase its after-tax profit through under-providing deferred tax. Firms which have recently issued shares may feel under pressure to report higher earnings (particularly if the issue was accompanied by a profit forecast); those intending to issue shares may seek to make the impending offer more attractive to potential investors by increasing the level of after-tax profits. The variable EQUITY is

defined as the proceeds of share issues during a period of account³² divided by the market value of equity capital at the start of that period of account.³³

H_I(F): There is a positive association between the issuance of equity and the extent of any under-provision of deferred tax

Auditor quality. Firms facing similar incentives to manage earnings may respond in different ways owing to variations in the potential penalties if any earnings management is detected. Although all firms in the sample are subject to the same legal and market reporting requirements, there is variation in the identity of their auditors. The auditing literature argues that audit quality, in terms of error detection and response, varies between different audit firms. Numerous studies, both theoretical and empirical, offer support that the largest audit firms provide superior quality (DeAngelo, 1981). To the extent that audits constrain earnings management, the employment of a higher quality auditor will reduce the level of both under- and over-provisioning. Antle and Nalebuff (1991) state that the penalties which auditors face for failing to detect or prohibit earnings overstatement are greater than those they face with earnings understatement. Empirical evidence confirms that auditors are more likely to be sued in relation to over-stating, rather than under-stating, earnings (St Pierre and Anderson, 1984). The variable AUD is defined as a binary variable to be 1 if the auditor was one of the (then) 'big six' firms, 0 otherwise.

²⁶ Benchmarked, perhaps, against the statutory rate.

²⁷ Corporation tax (*Datastream* item 160) minus double tax relief (*Datastream* item 162) plus overseas tax (*Datastream* item 167).

²⁸ *Datastream* item 154.

²⁹ Statement of Standard Accounting Practice 8: *The treatment of taxation under the imputation system in the accounts of companies* (Accounting Standards Committee, adopted by the Accounting Standards Board, issued August 1974, amended October 1992) does not require the separate disclosure of prior year adjustments. As an intriguing aside, Appendix 3 (added December 1977, revised 1988), which applies to companies subject to taxation in the Republic of Ireland, does require that 'material adjustments in respect of previous periods should be disclosed' (para. 28).

³⁰ *Datastream* item 199. The prior year tax adjustment figure obtained from *Datastream* is an aggregate item and may, therefore, include a deferred tax component. In testing the hypothesis relating to prior year adjustments, the source of the increase (decrease) in the tax charge is unimportant. We hypothesise that the presence of a prior year adjustment will result in an offsetting deferred tax adjustment, i.e., an under- or over-provision.

³¹ As gathered from copy financial statements.

³² Equity issued for cash (*Datastream* item 412) plus equity issued for acquisition (*Datastream* item 414), both including any share premium.

³³ *Datastream* item MV.

H_j(G): There is a negative association between auditor quality and the extent of any under-provision of deferred tax

Firm size. A firm's size may influence its willingness to manage earnings: large firms may have a higher political visibility and, therefore, have a greater incentive to reduce profitability in an attempt to reduce the likelihood and effect of political intervention (Watts and Zimmerman, 1978). Empirical studies of earnings management support this view (for example, Peasnell et al., 2000b). With specific regard to deferred tax, a counter-argument, based on anecdotal evidence, exists: in order to minimise compliance costs with SSAP15, small firms may provide in full thereby avoiding the exercise of estimating reversals. The variable *SIZE* is defined to be the natural logarithm of end-of-period market value of equity.³⁴

H_j(H): There is an association between firm size and the extent of any under- or over-provision of deferred tax

Advance corporation tax. The ultimate profit and loss effect of under- or over-providing deferred tax is dependent upon the amount of advance corporation tax (ACT) available to be set off against the provision. In the absence of surplus ACT, there is a direct pound-for-pound relationship between a change in the level of deferred tax provision and the resulting tax charge. When a firm has surplus ACT, however, the effect of under- or over-providing deferred tax may be 'dampened', since change in the level of deferred tax charge creates a proportional change in the maximum permissible ACT off-set. It is, therefore, necessary to control for ACT in testing the above hypotheses. The variable *ACTV* is defined to be the amount of surplus ACT set off against the period's deferred tax provision as scaled by the maximum potential deferred tax provision,³⁵ given positive sign for firms which under-provide deferred tax, and negative for those which over-provide deferred tax.

H_j(I): There is a positive association between the existence of surplus ACT and the extent of any under- or over-provision of deferred tax.

Finally, as discussed above, in testing these hypotheses there must be a control for uncertainty in forecasting since the under- or over-providing for deferred tax may occur simply as a result of uncertainty and errors in forecasting events and not as a result of deliberate management induced bias. In formulating an appropriate control variable, it is important to attempt to reflect the difficulty which management face in making accurate forecasts, i.e., a measure of variability in expectations, rather than variability in outcomes, would seem best.

The initial control variable,³⁶ *UNCERT*, is defined to be the coefficient of variation in analysts'

forecast earnings per share³⁷ for the year under review (following Baron and Stuerke, 1998), given positive sign for firms which under-provide deferred tax, and negative for those which over-provide deferred tax. The use of analysts' forecasts is motivated by the following link between capital expenditure and accounting earnings.

To the extent that capital markets are allocatively efficient, capital should be available to the potentially more profitable user in preference to the less profitable user. Consistent with this expectation, Welch and Wessels (2000) find that stock returns are a significant factor in explaining cross-sectional variation in levels of capital expenditure.³⁸ If accounting earnings and stock returns are linked, as suggested by an extensive empirical literature dating back to Ball and Brown (1968), then uncertainty over future accounting earnings transmit into uncertainty over stock returns, in turn implying uncertainty over levels of future capital expenditure. The exact nature of the relationship and the strength of the linkages will depend in part on the extent to which stock returns lead accounting earnings.

3.3. Data collection and sample selection

Ernst & Young (2001)³⁹ states that the forecast period projection for deferred tax calculation purposes '... will obviously become less reliable the further into the future it goes, and the period which may be forecast with a reasonable degree of accuracy may be no more than two years.'; and the original SSAP15 cited 'normally three years' concerning the forecasting period. The longer the forecasting period, *ceteris paribus*, the greater the opportunity to engage in un-penalised earnings management, given the greater the opportunity to disguise (or spuriously defend) such activity in terms of 'forecasting problems'. Therefore, it was desired to measure $PD_{t,x}$ with respect to a forecasting period, *x*, ranging from one year to four years. It was further desired to be able to perform analysis based on $PD_{t,x}$ at two successive year-ends. Thus, complete deferred tax data was required in respect of six successive years for each firm.

An initial sample of every one in three firms was drawn from the list of firms quoted on the London stock exchange as at 31 December 1992 (excluding financial firms), yielding 361 firms.⁴⁰ The need

³⁴ Datastream item *MV*.

³⁵ Both as gathered from copy financial statements.

³⁶ Subsequent sensitivity analysis employs two alternative control measures.

³⁷ As supplied by I/B/E/S.

³⁸ These authors also find change in levels of cash to be a significant factor.

³⁹ And earlier editions. Page 1,685 in the 2001 edition.

⁴⁰ Source of list of quoted firms: *Quality of Markets: Companies Book 1992*, published by The International Stock Exchange of the United Kingdom and the Republic of Ireland, London.

Table 2
Sample selection and screening process (number of firms)

One in three firms quoted on the LSE as at 31 December 1992	361
Of which, copy 1992 financial statements provided	316
Of which, copy financial statements 1993–1996 provided (initial sample)	147
Less firms with: (i) tax on rolled-over or held-over chargeable gains; (ii) tax on potential remittances of overseas income; or (iii) trading losses or surplus ACT in excess of the maximum amounts offsettable	(65)
Less firms which provided deferred tax in full	(24)
Final sample	58

to obtain six years of data required an earlier rather than a later start date. The years 1990 and 1991 were chosen because these were both years of relatively poor economic conditions. 1990 was the only year in the decade to experience a real fall in GDP (−1.20%), while 1991 experienced the lowest increase in GDP for the same period (0.002%). The likelihood of earnings management was considered to be higher under such conditions. In the absence of the required deferred tax information being available in a machine-readable form, a request for a copy of the 1992 financial statements was made of each of these 361 selected firms. Financial statements were received from 316 firms, and in the four subsequent years a similar request were made to each of these 316. The result was an initial sample of 147 firms, for which complete deferred tax data for the two periods 1991–1995 and 1992–1996 had been collected.⁴¹

A screening process then removed all firms that had provided in respect of any of the following deferred tax items in either 1991 or 1992: (i) tax on rolled-over or held-over chargeable gains; (ii) tax on potential remittances of overseas income; or (iii) trading losses or surplus ACT in excess of the maximum amounts offsettable.⁴² The result was to produce a sample of 82 firms with deferred tax liabilities relating only to the following items: capital allowances and other short term timing differences, trading losses and ACT. The final step was to exclude those firms which had provided deferred tax in full in either of 1991 or 1992, or which had maximum potential deferred tax asset balances. The final sample consisted of 58 firms. The sample selection and screening process is summarised in Table 2.

3.4. Empirical models

The following model was estimated for $t = 1991$ and 1992:

$$\overline{PD}_{t,4} = \alpha_t + \beta_{1,t} GEAR_t + \beta_{2,t} PROFIT_t + \beta_{3,t} \Delta PBT_t + \beta_{4,t} ETR_t + \beta_{5,t} PYTC_t + \beta_{6,t} EQUITY_t + \beta_{7,t} AUD_t + \beta_{8,t} SIZE_t + \beta_{9,t} ACTV_t + \beta_{10,t} UNCERT_t + \epsilon_t \quad (6)$$

In this model, to be termed the 'aggregated model', the dependent variable is the aggregated variable as defined in expression (4), with $x = 4$, i.e., the mean of four under / overprovision variables, as calculated according to expression (3) assuming a one-year, a two-year, a three-year and a four-year forecasting period.

The following model was estimated for $t = 1991$ and 1992, and for forecasting period one year, two years, three years and four years:

$$\begin{aligned} PD_{t,x} = & \alpha_t + \beta_{1,t} GEAR_t + \beta_{2,t} PROFIT_t + \beta_{3,t} \Delta PBT_t + \beta_{4,t} ETR_t + \\ & \beta_{5,t} PYTC_t + \beta_{6,t} EQUITY_t + \beta_{7,t} AUD_t + \beta_{8,t} SIZE_t + \\ & \beta_{9,t} ACTV_t + \beta_{10,t} UNCERT_t + \epsilon_t \end{aligned} \quad (7)$$

In this model, to be termed the 'disaggregated model', the dependent variable is as defined in expression (3), with x being, successively (for each of 1991 and 1992) one year, two years, three years and four years.

In each case, the α are model-specific intercepts; the β are model-specific slope coefficients; and the ϵ are model-specific stochastic error terms.

In all cases the models were estimated using ordinary least squares estimation, and also, for reasons explained in the next section, using two alternative 'robust' estimators (being an iteratively re-weighted least squares (IRLS) estimator and a bounded influence estimator). The estimations were performed on *SHAZAM Professional Edition* Version 9.0 (2001) and *STATA INTERCOOLED* Version 7.0 (2001).

⁴¹ The reduction to 147 firms was due to take-overs, failures and other de-listing events, and to changes at the firm level in the form of disclosure that rendered the data incompatible over time in a number of cases.

⁴² This screening was necessary owing both to the methodological assumption set out in an earlier section, and to inconsistency in disclosure relating to the screened items.

Table 3

Non-parametric correlation between alternative formulations of the dependent variable
Spearman's *rho*; N = 58 (all significant at the 1% level, one-tailed test)

Table 3.1 – 1991

	$\bar{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$
$\bar{PD}_{1991,4}$	1.000	0.871	0.931	0.932	0.922
$PD_{1991,1}$		1.000	0.862	0.749	0.703
$PD_{1991,2}$			1.000	0.868	0.834
$PD_{1991,3}$				1.000	0.902
$PD_{1991,4}$					1.000

Table 3.2 – 1992

	$\bar{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
$\bar{PD}_{1992,4}$	1.000	0.851	0.935	0.977	0.939
$PD_{1992,1}$		1.000	0.797	0.779	0.745
$PD_{1992,2}$			1.000	0.911	0.866
$PD_{1992,3}$				1.000	0.915
$PD_{1992,4}$					1.000

Variables:

$PD_{t,x}$ – Under (over) provision of deferred tax in year t as a proportion of the maximum potential deferred tax provision in year t , assuming a forecasting period for deferred tax purposes of x years. Five alternative formulations: $x = 1, 2, 3$ and 4 ; and an aggregate formulation, being the arithmetic mean of the variable under the other formulations.

4. Results

4.1. Descriptive statistics and univariate analyses

The correlations between $\bar{PD}_{1991,4}$, $PD_{1991,1}$, $PD_{1991,2}$, $PD_{1991,3}$ and $PD_{1991,4}$ are set out in Table 3. Given the high levels of skewness and / or kurtosis present in some of the variables, the reported pair-wise correlations are based upon a non-parametric measure (Spearman's *rho*).⁴³ As anticipated, the alternative formulations of the dependent variable are highly correlated. Similarly for the 1992 dependent variable. Table 4 shows summary statistics upon the variables, and Table 5 the pair-wise correlations coefficients for the continuous variables. In each table, 1991 and 1992 statistics are shown separately. The negative relationship between market value and variation in analysts' forecasts supports the use of the latter variable as a proxy for uncertainty. Fama and French's (1992) results were interpreted as indicating that firm risk decreases with firm size, a result consistent with the above relationship. To the extent that the degree of variation in analysts' forecasts is a function of the number of analysts making forecasts, then the inclusion of a size variable in our model has the additional effect of controlling for the positive relationship between firm size and number of analysts. The correlation analysis suggests that potentially high levels of multicollinearity should not be a feature of the data set (and subsequent multivariate analysis using condition indices supports this contention). The absence in either 1991 or 1992 of a significant correlation coefficient between the absolute value

of the dependent variable and the uncertainty control variable, coefficient of variation in analyst's forecasts, is addressed in the discussion of the multivariate results and is subject to robustness tests.

In both years, the majority of firms over-provide deferred tax (43 in 1991 and 42 in 1992). Table 6 summarises levels of under and over-provisioning for the sample. In interpreting the table and the following commentary, it is important to appreciate that the unbracketed figures represent the mean income effect before the dampening effect of any write off or write back of ACT,⁴⁴ while the bracketed amounts represent the corresponding values for the sample excluding all firms with surplus ACT. The mean amount of under-provision by the 15 (9) and 16 (9) under-providing firms 1991 and 1992 is £0.4m (£0.5m) and £0.7m (£0.8m) respectively. This represents 20.6% (22.1%) and 21.5% (23.0%) respectively of the related mean maximum potential deferred tax liabilities of £1.9m (£2.2m) and £3.2m (£3.3m). Among the over-providing firms, the mean amount over-provided in 1991 and 1992 amounted to £4.1m (£4.4m) and

⁴³ The issue of non-normality in a multivariate setting is addressed later in the paper.

⁴⁴ The impact (if any) of ACT is firm specific and, whilst in a multivariate setting the level of ACT set off is included as an explanatory variable, in an analysis of the aggregate level of under- and over-provision it is not possible to adjust for the impact of ACT. In order to do so, identification of individual firms' ACT capacity – requiring a division between UK and non-UK taxable profits – would be necessary.

Table 4
Summary statistics upon variables (N=58 for each variable in each year)

		Minimum	Maximum	Mean	SD	Skewness	Kurtosis
<i>1991</i>							
Alternative formulations of the dependent variable	$\bar{PD}_{1991,4}$	-86.10	65.47	-15.17	35.62	-0.07	-0.19
	$PD_{1991,1}$	-84.99	97.24	-21.08	36.05	0.32	0.88
	$PD_{1991,2}$	-100.00	72.73	-18.13	35.35	-0.10	0.29
	$PD_{1991,3}$	-80.89	94.84	-12.92	37.53	0.45	0.58
	$PD_{1991,4}$	-100.00	100.00	-8.53	45.53	0.38	0.09
Independent variables	<i>GEAR</i>	0.00	126.20	29.92	20.09	1.88	7.99
	<i>PROFIT</i>	0.00	1.00	0.90			
	ΔPBT	0.00	1.00	0.47			
	<i>ETR</i>	0.00	0.50	0.28	0.11	-0.78	1.01
	<i>PYTC</i>	-0.25	1.97	0.10	0.30	4.58	25.65
	<i>EQUITY</i>	0.00	0.64	0.06	0.14	2.95	9.14
	<i>AUD</i>	0.00	1.00	0.76			
	<i>SIZE</i>	1.31	9.10	4.45 ^{a,b}	1.65	0.35	0.03
	<i>ACTV^c</i>	0.00	0.62	0.09	0.15	1.96	3.53
	<i>UNCERT^c</i>	0.00	96.84	17.28	21.06	2.37	5.64
<i>1992</i>							
Alternative formulations of the dependent variable	$\bar{PD}_{1992,4}$	-100.00	85.29	-16.02	40.24	0.26	-0.10
	$PD_{1992,1}$	-100.00	76.47	-24.00	36.97	0.28	0.00
	$PD_{1992,2}$	-100.00	100.00	-16.48	41.24	0.60	0.63
	$PD_{1992,3}$	-100.00	100.00	-11.82	49.01	0.53	-0.23
	$PD_{1992,4}$	-100.00	100.00	-11.77	45.70	0.57	0.44
Independent variables	<i>GEAR</i>	0.00	123.75	29.42	21.65	1.59	5.13
	<i>PROFIT</i>	0.00	1.00	0.88			
	ΔPBT	0.00	1.00	0.52			
	<i>ETR</i>	-0.90	0.54	0.23	0.19	-3.64	20.77
	<i>PYTC</i>	-0.12	3.09	0.16	0.47	5.01	28.59
	<i>EQUITY</i>	0.00	0.37	0.03	0.07	2.96	9.06
	<i>AUD</i>	0.00	1.00	0.76			
	<i>SIZE</i>	1.58	9.17	4.64 ^{a,b}	1.59	0.25	0.11
	<i>ACTV^c</i>	0.00	0.70	0.10	0.15	2.03	4.90
	<i>UNCERT^c</i>	0.00	138.83	15.79	25.05	3.85	15.59

Notes:

^a difference between 1991 and 1992 distributions significant at 1% level (Wilcoxon signed rank test)

^b difference in means between 1991 and 1992 significant at 1% level (t-test)

^c summary statistics upon the absolute values of *ACTV* and *UNCERT*

Variables (see Table 1 for full description):

PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); ΔPBT – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

Table 5**Pair-wise correlation coefficients between variables: Spearman's *rho***

5%, 2.5% and 1% levels of significance denoted by *, ** and *** respectively; one or two-tailed tests as appropriate; reported correlation coefficients between the dependent variable and each of *ACTV* and *UNCERT* are as calculated using the absolute value of each of these, since ACT and uncertainty each contribute to both under- and over-provisioning

Table 5.1 – 1991

	$\overline{PD}_{1991,4}$	GEAR	ETR	PYTC	EQUITY	SIZE	ACTV	UNCERT
$\overline{PD}_{1991,4}$	1.00	0.15	0.02	-0.02	-0.10	-0.17	0.29 **	0.07
GEAR		1.00	0.00	0.23	-0.07	0.05	0.32 ***	0.17
ETR			1.00	0.19	0.13	-0.18	0.02	0.05
PYTC				1.00	-0.12	-0.24	0.07	-0.07
EQUITY					1.00	-0.12	-0.14	0.28 *
SIZE						1.00	-0.11	-0.39 ***
ACTV							1.00	0.42 ***
UNCERT								1.00

Table 5.2 – 1992

	$\overline{PD}_{1992,4}$	GEAR	ETR	PYTC	EQUITY	SIZE	ACTV	UNCERT
$\overline{PD}_{1992,4}$	1.00	0.11	-0.03	0.14	-0.36 ***	-0.17	0.24 *	0.10
GEAR		1.00	-0.22	0.20	-0.23	0.10	-0.03	0.09
ETR			1.00	0.30 **	0.13	-0.13	-0.01	0.08
PYTC				1.00	-0.13	-0.25	0.18	0.26 *
EQUITY					1.00	0.08	-0.09	-0.12
SIZE						1.00	-0.01	-0.20
ACTV							1.00	0.43 ***
UNCERT								1.00

Variables (see Table 1 for full description):

PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); ΔPBT – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

£4.3m (£5.0m) respectively, by the 43 (23) and 42 (20) firms concerned. These amounts represent 19.61% (14.0%) and 21.5% (23.0%) of the mean

maximum potential deferred tax liabilities of £20.8m (£31.0m) and £21.9m (£36.3m) in the two years. An alternative view of the level of under-/over-providing is by reference to mean level of profits. The level of over-provision represented 8.9% (9.4%) and 8% (5.6%) of the net profit before tax for 1991 and 1992 respectively. The percentages for the under-providing firms were 8.7% (9.3%) and 51.9% (66.7%). On average, the levels of under- and over-provision are significant in an economic sense when measured against both the maximum potential deferred tax provision and, more importantly, the level of pre-tax profit. The preponderance of over-providing might represent firms generally under estimating future levels of capital expenditure. Independent of earnings management, this could result if firms were unduly pessimistic about the state of the economy during the forecast period.⁴⁵ In the absence of individual firm planned and actual capital expenditure levels

⁴⁵ We thank a referee for suggesting this possible explanation.

⁴⁶ An analysis of GDP forecasts and realised outcomes could give an indication to the degree of unexpectedness in changes in the level of GDP during the forecast periods. Using data published by the National Institute of Economic and Social Research in the *National Institute Economic Review* (various years) the realised levels of real GDP in 1992, 1993, 1994 and 1995 are similar to, although consistently lower than, the levels for each of those years as forecast in 1991 (actual from index base of 100: 100.07, 102.38, 106.92 and 109.85; and forecast: 102.1, 104.65, 107.48 and 110.49 respectively). In contrast, the forecasts made in 1992 are consistently exceeded by the realised levels (actual: 102.31, 106.84, 109.77 and 112.62; and forecast: 102.0, 104.55, 106.64 and 108.56). This difference in the accuracy of the 1991 and 1992 based GDP forecasts is not, however, apparent in a material increase in the frequency or level of over providing in 1992 relative to 1991 (see Table 6).

Table 6
Comparison of mean levels of under- and over-providing with level of maximum potential deferred tax and profit before tax
 (bracketed figures relate to the sub-sample of firms without surplus ACT)

	<i>Number</i>	<i>Over provision (£'000s)</i>	<i>Under provision (£'000s)</i>	<i>Maximum potential provision (£'000s)</i>	<i>Over / under provision as % of maximum potential</i>	<i>Profit before tax (£'000s)</i>	<i>Over / under provision as % of profit before tax</i>
<i>1991</i>							
Under-providers	15 (9)	400 (485)	1,943 (2,191)	20.6% (22.1%)	4,577 (5,241)	8.7% (9.3%)	
Over-providers	43 (23)	4,070 (4,352)	20,814 (30,994)	19.6% (14.0%)	45,953 (46,190)	8.9% (9.4%)	
<i>1992</i>							
Under-providers	16 (9)	685 (763)	3,182 (3,276)	21.5% (23.0%)	1,319 (1,144)	51.9% (66.7%)	
Over-providers	42 (20)	4,334 (4,963)	21,889 (36,286)	19.8% (13.7%)	54,310 (89,353)	8.0% (5.6%)	

**Table 7
OLS and robust multivariate regression results**
(5%, 2.5% and 1% levels of significance denoted by *, ** and *** respectively; one or two-tailed tests as appropriate)

Table 7.1 – 1991

$$PD_t = \alpha_1 + \beta_{1,t} GEAR_t + \beta_{2,t} PROFIT_t + \beta_{3,t} \Delta PBT_t + \beta_{4,t} ETR_t + \beta_{5,t} PYTC_t + \beta_{6,t} EQUITY_t + \beta_{7,t} AUD_t + \beta_{8,t} SIZE_t + \beta_{9,t} ACTV_t + \beta_{10,t} UNCERT_t + \varepsilon_t$$

t = 1991; five different formulations of the dependent variable (see Table 1 and Section 3.1)

	OLS				Robust					
	$\overline{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
Dependent variable										
GEAR	0.268 (1.381)	-0.076 (-0.312)	0.248 (1.202)	0.452 (2.441***)	0.279 (1.657)	0.256 (1.22)	0.025 (0.10)	0.181 (0.96)	0.509 (2.41**)	0.309 (1.63)
PROFIT	-50.450 (-3.445***)	-40.319 (-2.578***)	-24.476 (-1.820*)	-31.006 (-2.002*)	-55.580 (-4.541***)	-50.767 (-3.27***)	-38.499 (-2.39**)	-34.416 (-2.75***)	-41.529 (-2.69***)	-53.699 (-3.83***)
ΔPBT	7.079 (0.958)	6.657 (0.754)	5.499 (0.717)	6.121 (0.970)	3.464 (0.538)	6.157 (0.76)	4.989 (0.55)	14.337 (2.05*)	4.339 (0.51)	3.115 (0.43)
ETR	-1.6178 (-0.049)	-10.522 (-0.253)	14.228 (0.418)	18.649 (0.652)	12.756 (0.433)	7.286 (0.20)	-18.822 (-0.44)	32.1671 (1.01)	28.334 (0.73)	20.367 (0.60)
PYTC	-37.036 (-3.478***)	-32.229 (-2.446**)	-43.931 (-4.027***)	-30.756 (-5.117***)	-50.073 (-5.381***)	-39.823 (-3.41***)	-35.948 (-2.65***)	-48.567 (-4.79***)	-32.308 (-2.74***)	-51.746 (-4.87***)
EQUITY	-54.949 (-2.084**)	9.402 (0.289)	3.446 (0.131)	-16.461 (-0.507)	-81.817 (-3.535***)	-55.631 (-1.98*)	-8.1315 (-0.24)	60.378 (2.46***)	-31.692 (-1.06)	-87.131 (-3.29***)
AUD	-0.048 (-0.006)	-2.662 (-0.274)	-5.528 (-0.638)	-4.824 (-0.594)	2.102 (0.278)	-3.465 (-0.41)	-16.983 (-1.70*)	-13.640 (-1.80*)	-4.999 (-0.56)	4.261 (0.52)
SIZE	-0.797 (-0.399)	1.709 (0.692)	0.165 (0.081)	-1.745 (-0.912)	-1.568 (-0.905)	-1.215 (-0.56)	0.311 (0.12)	-0.266 (-0.14)	-2.762 (-1.23)	-1.849 (-0.93)
ACTV	93.081 (4.757***)	63.797 (2.404***)	87.730 (4.426***)	106.48 (5.984***)	119.59 (6.883***)	102.536 (4.83***)	82.374 (3.02***)	76.6935 (4.16***)	117.418 (4.98***)	118.031 (5.93***)
UNCERT	0.365 (2.475***)	0.426 (2.657***)	0.291 (2.044**)	0.343 (3.216***)	0.696 (5.719***)	0.319 (1.97*)	0.323 (1.96*)	-0.049 (-0.37)	0.402 (2.73**)	0.699 (5.02***)
Constant, α	37.282 (2.263*)	20.265 (1.040)	5.167 (0.319)	17.704 (0.880)	49.893 (3.522***)	43.959 (2.54)	41.7423 (2.08*)	14.229 (0.95)	33.253 (1.90)	46.897 (2.91***)

Table 7.1 - 1991 (continued)

Dependent variable	OLS				Robust			
	$\bar{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$	$\bar{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$
N	56	58	56	57	56	58	58	58
Jarque-Bera $\sim \chi^2(2)$	4.849	1.786	4.492	4.226	2.402			
Breusch-Pagan $\sim \chi^2(10)$	10.829	5.728	9.041	20.586**	7.682			
RESET	0.001 (1,44)	0.075 (1,46)	0.001 (1,44)	0.420 (1,45)	0.165 (1,44)			
R ²	0.592	0.386	0.527	0.516	0.791			
F-test	8.965*** (10,45)	4.586*** (10,47)	7.122*** (10,45)	6.978*** (10,46)	21.765*** (10,45)	9.30*** (10,47)	4.87*** (10,47)	7.85*** (10,47)
						4.87*** (10,47)	7.85*** (10,47)	9.30*** (10,47)

Variables (see Table 1 for full description):

PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); ΔPBT – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

Table 7 (continued)

Table 7.2 – 1992
(variable definitions as per Table 7.1)
$$PD_t = \alpha_1 + \beta_{1,t} GEAR_t + \beta_{2,t} PROFIT_t + \beta_{3,t} APBT_t + \beta_{4,t} ETR_t + \beta_{5,t} PYTC_t + \beta_{6,t} EQUITY_t + \beta_{7,t} AUD_t + \beta_{8,t} SIZE_t + \beta_{9,t} ACTV_t + \beta_{10,t} UNCERT_t + \varepsilon_t$$

$t = 1992$; five different formulations of the dependent variable (see Table 1 and Section 3.1)

	OLS				Robust			
Dependent variable	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$
GEAR	0.319 (1.451)	0.238 (1.075)	0.319 (1.512)	0.481 (1.872*)	0.089 (0.390)	0.329 (1.44)	0.209 (0.91)	0.412 (1.79*)
PROFIT	-22.064 (-1.286)	1.156 (0.067)	-35.496 (-2.178**)	-32.644 (-1.633)	-62.436 (-3.502***)	-16.391 (-0.93)	-0.682 (-0.04)	-35.800 (-2.08**) -39.378 (-1.96*)
APBT	-1.766 (-0.194)	-6.211 (-0.664)	-14.022 (-1.577)	-4.537 (-0.425)	-6.694 (-0.703)	-1.134 (-0.12)	-7.345 (-0.76)	-11.726 (-1.24) -11.360 (-1.06) -9.188 (-0.92)
ETR	28.009 (0.995)	9.697 (0.344)	46.910 (1.740*)	33.941 (1.032)	56.936 (1.942*)	25.478 (0.87)	12.555 (0.43)	44.405 (1.57) 54.941 (1.66) 34.688 (1.13)
PYTC	-23.352 (-2.594***)	-23.819 (-2.628***)	-21.218 (-2.465***)	-28.920 (-2.753***)	-29.992 (-3.204***)	-17.463 (-1.87*)	-22.091 (-2.36***)	-52.086 (-2.89***) -27.503 (-2.60***) -24.845 (-2.53***)
EQUITY	-22.337 (-0.389)	-18.478 (-0.319)	-37.518 (-0.683)	-58.888 (-0.877)	-0.385 (-0.006)	-48.148 (-0.81)	-27.018 (-0.45)	-44.707 (-0.77) -36.034 (-0.53) -7.740 (-0.12)
AUD	2.872 (0.274)	-1.873 (-0.178)	-4.423 (-0.443)	-3.883 (-0.318)	4.313 (0.395)	-8.942 (-0.82)	-8.114 (-0.74)	-3.705 (-0.35) 4.489 (0.37) -0.110 (-0.01)
SIZE	-2.636 (-0.961)	-2.558 (-0.929)	-3.649 (-1.391)	-5.052 (-1.573)	-1.441 (-0.508)	-4.190 (-1.47)	-2.877 (-1.01)	-4.443 (-1.59) -3.389 (-1.05) -0.981 (-0.33)
ACTV	80.967 (3.951***)	101.81 (3.887***)	155.68 (5.857***)	149.35 (5.024***)	122.82 (4.816***)	122.678 (4.65***)	107.773 (3.98***)	136.597 (4.84***) 142.159 (5.05***) 115.538 (4.32***)
UNCERT	0.326 (3.197***)	0.409 (2.694***)	0.314 (2.178**)	0.403 (2.321***)	0.404 (2.603***)	0.449 (2.93***)	0.406 (2.58***)	0.322 (2.13***) 0.358 (2.05**) 0.437 (2.68***)
Constant, α	6.847 (0.357)	-2.457 (-0.122)	41.847 (2.248*)	41.687 (1.866)	47.9480 (2.397**)	30.484 (1.54)	11.095 (0.53)	43.548 (2.22) 34.013 (1.51) 34.623 (1.65)

Table 7.2 – 1992 (continued)

Dependent variable	OLS				Robust			
	$\bar{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$	$\bar{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$
<i>N</i>	58	58	58	58	58	58	58	58
Jarque-Bera $\sim \chi^2(2)$	2.016	4.771	1.232	1.412	1.348			
Breusch-Pagan $\sim \chi^2(10)$	12.808	3.663	10.158	16.296	12.703			
RESET	2.125 (1.46)	6.82** (1.46)	2.976 (1.46)	0.193 (1.46)	0.075 (1.46)			
<i>R</i> ²	0.442	0.328	0.513	0.486	0.531			
F-test	5.513*** (10.47)	3.782*** (10.47)	6.997*** (10.47)	6.395*** (10.47)	7.454*** (10.47)	6.23*** (10.47)	3.74*** (10.47)	6.23*** (10.46)
								5.70*** (10.47)
								5.13*** (10.47)

Note: The sample size is reduced to 57 because an initial step of the IRLS procedure is to calculate the Cook's statistic for all observations and exclude those which are deemed to be overly influential (i.e., for which the Cook's statistic is more than one).

for each year in the forecasting period, it is not possible to control for the degree of under/over-provision attributable to unexpected levels of economic growth. Analysis of forecast and realised levels of GDP suggests that any tendency to under-estimate future levels of capital expenditure does not derive from uncertainty over the general level of economic activity.⁴⁶ Such a broad analysis cannot rule out firm or industry specific factors.

Cross-tabulation analyses (not reported) suggests that there is no relationship between audit firm quality and the level and/or frequency of under-/over-provision in either 1991 or 1992.⁴⁷ Similarly, no significant differences are found when comparing the level and frequency of under-provision and over-provision between firms reporting an increase in profits as against those reporting a loss, or between those issuing equity versus non-issuers.

In order to assess the potential influence of analysts' forecasts on the level of earnings management, an analysis was performed on a sample comprising firms without surplus ACT. Of the 33 such firms in 1991, 11 reported earnings per share in excess of the mean analysts' forecast. In 1992, eight out of 30 such firms similarly exceeded expectations. In the absence of under-providing, four of those firms would have failed to the forecast in 1991, and two firms would similarly have failed in 1992. There is, therefore, some evidence that some of the firms exceeded the analysts' expectations by under-providing. This finding, however, must be qualified by the absence of a general relationship between the level of under-/over-provision on a per share basis and the difference between reported EPS and mean analyst forecast EPS (results not reported).

4.2. Multivariate results

Table 7 sets out the results of estimation of the aggregated model (6) and the disaggregated models (7) using both OLS and IRLS robust estimators.⁴⁸ Table 7.1 covers 1991, and Table 7.2 1992.

Initial OLS estimations using the full sample of 58 firms suffered from significant levels of non-normality in the distribution of the residuals for 1991.⁴⁹ Consequently, the reported OLS results are based on an iterative process designed to result in estimated models which do not appear to violate the assumption of normality in the residuals: the observation associated with the largest absolute residual was removed, the model re-estimated, and so forth until the Jarque-Bera statistic ceased to be significant at the 5% level. For the aggregated model, this process resulted in the removal of two firms for 1991 (none for 1992).

Additional diagnostic tests were performed, assessing multicollinearity, and testing for the presence of model misspecification, heteroskedasticity and influential observations. The level of multicollinearity amongst the independent variables ap-

pears to be acceptable: in all cases, the highest condition index for each set of independent variables is less than the suggested critical level of 10 (Belsley et al., 1980).⁵⁰ The Ramsey reset test was employed in order to assess model misspecification. Test statistics based on squared, cubed and fourth power transformations were estimated, although, in the interests of economy, only those based on the squared transformation are reported in Table 7. The test statistics are not significant at the 5% level, with the exception of the 1991 disaggregated model using a three-year forecast horizon, the 1992 aggregated model, and the 1992 disaggregated model using a one-year forecast horizon.⁵¹ Overall, therefore, there is little evidence to suggest the models are mis-specified. The degree of heteroskedasticity was assessed using the Breusch-Pagan test. With the exception of the 1991 disaggregated model based on a three-year horizon, the test statistics were not significant at the 5% level. In the exceptional case, the reported t-statistics are corrected using the White (1980) adjustment.⁵²

Analysis of the aggregated OLS models based on the sample of 58 firms identified a number of observations as being 'influential' using the DFITS criteria (Belsley et al., 1980).⁵³ The combination of non-normality and influential observations is an appropriate setting in which to employ robust estimation techniques. Two such techniques were employed: an iteratively re-weighted least

⁴⁷ In each of 1991 and 1992, 76% of sample firms were audited by 'big 6' audit firms.

⁴⁸ In the interests of economy, the results from only one of the robust estimators employed are reported – those from IRLS. The results of the bounded-influence estimator indicate that the reported OLS results are not driven by the presence of influential observations (see subsequent discussion). All the significant coefficients reported under the OLS estimations retain their statistical significance under bounded influence estimation, with two exceptions – those being *GEAR* in the 1991 estimation of the disaggregated model using a three year forecasting period, and *EQUITY* in the 1991 estimation of the aggregated model. The discussion of results in Section 4.2 is restricted to reporting upon and comparing the results of OLS and IRLS estimation.

⁴⁹ As indicated by a Jarque-Bera test statistic of 7.098 for the 1991 aggregated model.

⁵⁰ Indeed, the highest condition index had values 2.924 (1991) and 2.814 (1992).

⁵¹ Where the F statistic values are 6.196 (3, 43), 4.312 (3, 44) and 5.214 (1, 46) respectively, all significant at the 1% level.

⁵² Although the Breusch-Pagan (1979) test is a large sample test and when used on 'small samples' can be 'liberal', the largest test statistic, with the exception of the three referred to above is, 11.385 (10 d.f.) – significant at 32%. Any liberal tendencies of the test in a small sample test would, therefore, not appear to be sufficient to change the conclusion that the level of heteroskedasticity is not serious.

⁵³ In 1991 and 1992, nine and two observations respectively had absolute values of the DFITS statistic in excess of the critical value of 0.816 – the critical value being determined as $2 \times \sqrt{p/n}$, where p = number of regressors and n = number of observations (Belsley et al., 1980).

squares (IRLS) estimator (Hamilton, 1991); and a bounded-influence estimator (Goldstein, 1991). The IRLS estimator is less sensitive than OLS to violations of the normality assumption arising from influential or outlying observations of the dependent variable, whilst the bounded-influence estimator has the effect of reducing the impact of outlying or influential observations of the independent variables.

In the aggregated models, the profit coefficient is of the hypothesised negative sign in both 1991 and 1992 and, although statistically significant at the 1% level in 1991, it is marginally insignificant in 1992. In the sets of disaggregated models, however, the coefficient is significant in all cases for 1991, and in two (three when using IRLS estimation) of the four cases in 1992. The relationship is consistent with a smoothing process: income-increasing (-reducing) earnings management is associated with a pre-tax loss (profit).⁵⁴ An alternative explanation, which cannot be discounted, is that, relative to profit making firms, loss-making firms systematically over forecast future levels of capital expenditure when determining the required level of deferred tax provision.

A similar smoothing process seen to be associated with the level of adjustments to prior year tax charges. Decreases (increases) in income resulting from such adjustments are associated with income-increasing (-decreasing) earnings management. The relationship is consistent across both years. In the aggregated models, the coefficient is of the hypothesised negative sign in both 1991 and 1992, statistically significant at the 1% level. When estimated in the disaggregated models, the coefficient is significant at the 1% level in all four cases in 1991 all of the four cases in 1992. This relationship is consistent with firms which anticipate a future potential adjustment to prior year tax, in particular an additional charge, incorporating its likely effect in the current year's deferred tax charge. The incentive in so doing is to avoid recording explicitly the likely adjustment as a tax charge adjustment, since this could weaken the firm's negotiating position with the tax authorities. If a liability is subsequently determined, then it is recorded in the tax charge, and a corresponding transfer made from the deferred tax provision – resulting in a zero net effect in the tax charge of the period in which the final liability is agreed.

There is weak evidence of a relationship between earnings management and the level of gearing. In the aggregated models the relationship is consistently positive as hypothesised – though not statistically significant in either 1991 or 1992. In the disaggregated models the coefficient is significant at the 1% level in one case out of four in both 1991 and 1992.

There is no evidence of a systematic relationship between the direction of annual change in profit

and the dependent variable in the aggregated models. In the disaggregated models, the relevant coefficient is statistically significant in only one instance (in 1991), and generally lacks consistency as concerns the direction of any association. The coefficient is positive in all four cases in 1991, and negative in all four cases in 1992.

The effective tax rate variable coefficient is generally of the hypothesised positive sign. The only occurrences of a negative sign are in the aggregated model and one of the disaggregated models for 1991. In two cases in 1992 the coefficient is statistically significant (both at the 5% level), lending some support to the hypothesised smoothing role of deferred tax in arriving at the provision for the overall corporate tax charge. There is one observation of a negative ETR (during 1992). When this is controlled for using a dummy variable, the previously insignificant ETR coefficients do not take on significance (at generally accepted levels), however, in one of the two cases mentioned above, the ETR coefficient ceases to be significant at a generally acceptable level.

The relationship between the equity variable and the dependent variable is counter to expectations. The coefficient is negative in the aggregate models for both 1991 and 1992, significant at the 2.5% level in 1991 (5% in the case of IRLS estimation). Similarly, in the disaggregated models the coefficient is negative in the majority of cases and is statistically significant at the 1% level in one case for 1991 (two cases under IRLS estimation). This implies that firms over provide deferred tax in the year of an equity issue. This might result from firms being more cautious as a result of expectations of increased levels and / or intensity of market scrutiny surrounding and following a capital issue. Such behaviour, however, would be contrary to the finding of increased earnings management at the time of IPOs (Teoh et al., 1998). It is possible that earnings management precedes the issuance of equity and that a lagged explanatory variable is appropriate. As a further test, therefore, the 1991 models were re-estimated with a one year lagged equity variable. Although the resulting estimated coefficient is positive in the aggregated model and in three of the four disaggregated models, it is not statistically significant at generally accepted levels in any of them.

There is mixed evidence as to a relationship between audit firm quality and the level of earnings management. In the aggregated models the auditor variable had the anticipated negative sign only in 1991, but was not statistically significant. Likewise, insignificant were the positive signed

⁵⁴ When the binary profit independent variable is replaced by a continuous variable measuring profitability (pre-tax profit or loss as a percentage of sales) there is only very limited evidence of a significant relationship.

coefficients estimated in the 1992 models. The coefficient was, however, of the anticipated sign and statistically significant in two of the 1991 disaggregated models under the IRLS estimation. As an alternative test of the auditor quality hypothesis, the models were re-estimated using the absolute value of the appropriate dependent variable. This would be an appropriate formulation if auditors face a symmetrical loss function in respect of under- and over-provision. The results, not reported separately, do not indicate a statistically significant relationship in any of the models – though in all cases the relevant coefficient has a negative sign, lending weak support to the initial hypothesis.

Though there is a lack of generally acceptable levels of statistical significance in respect of the coefficient for the firm size variable in either 1991 or 1992, the coefficient is negative in all but two cases in the disaggregated models (or all but one when using IRLS estimation), and in all cases of the aggregated model. The lack of significance in respect of firm size, however, ought to be interpreted with caution. The data screening process removed a number of the larger, more complex firms with the result that the full range of firm sizes is not represented in the sample.⁵⁵

The most consistent result is the positive relationship between the level of ACT and the dependent variable in all of the models: in every case it is significant at the 1% level. This lends support to the argument that firms recognise and take into account the dampening effect of surplus ACT when determining the level of earnings management required to achieve a desired net result. Of firms which under-provide, the greater the amount of ACT set off the higher the level of under-provision. This is consistent with the impact of deferred tax under-provision reducing the capacity to offset ACT and thereby resulting in an increase in the tax charge from the write-off of surplus ACT that can no longer be set off. In order to achieve a given net reduction in the tax charge, a greater level of under-provision is required in the presence of surplus ACT than is required in the absence of surplus ACT. Similarly, for those firms which over-provide, the level of over-provision increases with the level of ACT set off. By over-providing, the tax charge is increased, but it is simultaneously reduced by the avoidance (or reduction in the level of) ACT required to be written off. Therefore, a higher over-provision is required in the presence of surplus ACT in order to achieve a given reduction in after tax earnings. This result is consistent with the weaker evidence surrounding the influence of the level of effective tax rate, in that firms look at the overall effects on profits (in this instance, on tax charge), rather than on the effect on single line items. Regarding the relationship in respect of over-providing firms, an alternative motivation concerns the potential signalling

implications of writing off surplus ACT: firms increase their capacity to offset ACT by over-providing deferred tax, thereby reducing the likelihood of having to write off ACT. This interpretation is suggestive that the writing off of surplus ACT through the current tax charge is a strong negative signal about the level of future profitability and dividends.

Under both OLS and IRLS estimation, the uncertainty control variable is positive and significant over both years in all cases but one. As reported in the univariate analyses, however, the variable's correlation with the absolute value of the dependent variable is not statistically significant. Its significance in a multivariate setting, therefore, may be in part due to the need for it to take a positive sign when the firm concerned is under-providing, and a negative sign when the firm is over-providing. To the extent that this variable fails to control fully for uncertainty and the other independent variables do proxy for uncertainty, then the estimated coefficients may be biased (Maddala, 2001). Although there is no reason to suspect that the other independent variables are, in fact, correlated with uncertainty, the models have been re-estimated, excluding from the sample all firms that are considered to be 'marginal' over- or under-providers (and whose under- or over-provision may, therefore, be inaccurately ascribed to earnings management). When firms whose under- or over-provision, as measured by the independent variable, is within the range $\pm 5\%$ are excluded on the basis that the scale of their under- or over-provision falls within a reasonable margin of error, then the distribution of under- and over-providers is as follows: in 1991 the number of under-providers – as calculated by expression (4) – falls to 12 and the number of over-providers is reduced to 30.

Similarly, in 1992, the number of under-providers is reduced to 14, and the number of over-providers to 30. When the models are re-estimated, the results are qualitatively the same as reported above, with the following exceptions where significance of the coefficient(s) is lost: under OLS estimation, the equity variable in the 1991 aggregated model, the profit and gearing variables in the 1991 disaggregated model based on a three-year horizon, and the profit variable in the 1992 disaggregated model based on a two-year horizon; and under robust estimation, the equity variable in both the 1991 aggregated model and the 1991 disaggregated model based on a two-year horizon, the auditor variable in the 1991 disaggregated model based on both a one and a two-year horizon, the direction of profit change variable in the 1991 disaggregated model

⁵⁵ A comparison of the maximum firm value in the initial and final (screened) samples shows this to be the case: in 1991 the values were £12,452m and £8,968m respectively; in 1992, £18,812m and £9,586m.

based on a two-year horizon, the adjustment to prior year tax variable in the 1991 disaggregated model based on a three-year horizon, and the profit variable in the disaggregated model for 1992 based on both a two-year and a three-year horizon.

As a further assessment of the sensitivity of the reported results to the proxy for forecasting uncertainty, two alternative measures were employed: the coefficient of variation of the level of net capital expenditure,⁵⁶ and the coefficient of variation of the level of sales⁵⁷ (both as measured over the maximum, four-year planning horizon). While these measures have limitations (for example, observed variations in capital expenditure may have been intentional, and the formal linkage between variations in planned capital expenditure and sales is unknown) the exercise is useful in assessing robustness. Results based on these two alternative control variables are not qualitatively different from those based on the analysts' forecast derived variable and, therefore, are not reported separately.⁵⁸ Overall, this additional analysis suggests that the reported results are not driven significantly by failure fully to capture uncertainty.

In summary, there is strong evidence of an association between levels of over- (under-) provision and profit status, level of adjustment to prior year tax and presence of surplus ACT. There is weaker evidence of an association with the levels of gearing and effective tax burden.

5. Summary and conclusions

This paper finds evidence of systematic differences between actual and required levels of deferred tax provision. The amounts involved are economically significant. In the most conservative of settings, that of firms without surplus ACT, the mean amount of under-provision represents 9.3% and 66.7% of pre-tax profits in 1991 and 1992 respectively. Comparable figures for those firms over-providing are 9.4% and 5.6%. Surprisingly, in the light of recent events, the majority of firms in the study over- rather than under-provided; and in each formulation of the focal dependent variable, its mean represented an over-provision.

Detected levels of under- and over-provision can result from a combination of earnings management and forecasting error. After controlling for uncertainty (proxied by cross-sectional variations in the predictability of firms' future earnings and, alternatively, by variations in capital expenditure and sales), there is support for some of the hypothesised earnings management incentives and influencers. In particular, there is evidence to support incentives and influencers concerning profit status, level of adjustment to prior year tax, and ACT. There is also evidence, albeit weaker, of incentives related to gearing and effective tax burden.

To the extent that earnings management is not

transparent to the market, there is a potential welfare loss. The findings of this paper, however, taken in isolation, should not be used as an argument for increased limitation of managerial discretion in the determination of financial accounting estimates. In the specific setting of deferred taxation, indeed, there is evidence that the exercise of managerial discretion can result in value-relevant information, which would otherwise remain private and within the firm, being publicly disclosed (Citron, 2001).

This study has limitations: the difficulty in controlling for forecasting uncertainty with precision; relatively small sample size resulting from the inability of the model of required provisions to deal with timing differences other than those relating to capital allowances and other short-term differences (for example relating to interest and general provisions);⁵⁹ and, while a variety of results have been provided based on varying length of forecast horizon, the implicit assumption in estimating each model that all firms use the same period over which to estimate reversals. Given these limitations, care should be exercised in attempting to generalise the results.

The paper makes a number of contributions to the literature. In particular, the estimation of levels of potential earnings management uses, primarily, publicly available data and, therefore, avoids some of the limiting issues relating to existing methodologies. The paper develops a number of new hypotheses in relation to earnings management, in particular the influence of adjustment to prior year tax and current effective tax burdens, and the impact of and interaction with related accounting items, in this case ACT. The results relating to ACT support the view that firms engaging in earnings management focus on the overall net effect, rather than viewing each potential item in isolation. In focusing in a single profit and loss state-

⁵⁶ Datastream items 1024 and 1025.

⁵⁷ Datastream item 104.

⁵⁸ As compared with the reported results, the differences resulting consistently from both alternative control variables can be summarised as follows: 1991 – *GEAR* is not significant at 5% level in the aggregated model under robust estimation, *PROFIT* is not significant at 5% in the disaggregated model using a three-year forecasting period under robust estimation, *EQUITY* is not significant at the 5% in the aggregated model under either OLS or robust estimation, and *AUD* is not significant at 5% level in the disaggregated model using a two-year forecasting period under robust estimation; 1992 – *GEAR* is not significant at 5% level in the disaggregated model using a two-year forecasting period under robust estimation; but *APBT* is significant in the same model. The general convergence in the results is to be expected given significant correlations amongst the three control variables.

⁵⁹ Albeit this may speak for the power of the methodology used in this study, since the sample constraint may well have resulted in the elimination of a number of larger, more complex firms, where, for example, capital market incentives to manage earnings may have been strong (thus making it harder to detect the hypothesised associations).

Appendix: example calculation of deferred tax under-provision from information disclosed in financial statements (accelerated capital allowances)

Consider a firm which uses straight-line depreciation at 20% p.a., enjoys capital allowances at 90% p.a. on a reducing balance basis, and faces a constant corporation tax rate of 33%. Assume that the firm starts with no fixed assets subject to depreciation or capital allowances, then acquires £1000 of such assets in year 1, £400 in year 2 and £20 in year 3. This would give rise to the following:

	Year 1	Year 2	Year 3	
<i>Per financial accounting</i>				
Opening net book value	0	800	920	
Additions	1,000	400	20	
Depreciation	-200	-280	-284	
Closing net book value	800	920	656	
<i>Closing cost</i>	1,000	1,400	1,420	
<i>Per taxation computation</i>				
Opening written down value	0	100	50	
Purchases	1,000	400	20	
Capital allowances	-900	-450	-63	
Closing written down value	100	50	7	
Cumulative timing difference	700	870	649	
Assuming no other sources of timing differences and a forecasting period of two years for the purposes of computation of deferred tax, we should see the following disclosed in the financial statements of the firm:				
Disclosed in FS at end of year 1	Total potential deferred tax as at end of year 1 Deferred tax provision	231.00 16.83 = (700-649) x 33%	= 700 x 33% = (700-649) x 33%	A B
Disclosed in FS at end of year 3	Total potential deferred tax as at end of year 3	214.17	= 649 x 33%	C

Therefore, any surplus of disclosed figure C over unprovided deferred tax at the end of year 1 (disclosed figure A less disclosed figure B) constitutes an over-provision of deferred tax at the end of year 1, and vice versa for under-provision. See Section 3.1 for general boundary conditions.

ment item, of course, this study potentially ignores the effect of earnings management which may have occurred via other account items. Through examining independently two different years, this study provides evidence that the strength of particular earnings management incentives can vary over time as well as across firms. Detecting earnings management using a new method, the paper corroborates existing earnings management studies and, in particular, adds to the limited number of existing UK earnings management studies.

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The effects of the auditor's professional qualification and the firm's financial health on depreciation in Finland

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Abstract—This study examines the relationship in Finland between the firm's financial health and the depreciation policy for a sample with 1,610 firm-years of data for mainly non-public firms. We find a negative correlation between leverage and depreciation in relation to depreciable assets. This result is consistent with prior studies showing that firms with a higher leverage use income-increasing accounting methods. However, since accounting-based debt covenants are rare among the size class of firms studied, the correlation is likely to be driven by implicit contracting related factors. We also study whether the auditors' professional qualifications correlate with the depreciation policy. The results indicate that Big 5 audited firms depreciate their assets over somewhat shorter periods of time than non-Big 5 audited firms. This result is consistent with the notion that Big 5 auditors are more conservative, perhaps because they have more reputation capital at stake.

1. Introduction

Incentives to manage earnings arise since accounting figures are frequently used as the basis for explicit as well as implicit contracts between the firm and its claimholders. This paper examines the effects of the firm's financial health and audit quality on earnings management through depreciation for a sample with 1,610 firm-years of Finnish data for predominantly non-public firms.

Most prior studies have studied earnings management by public firms. There are several reasons why the incentive to manage earnings should differ between large firms with publicly traded securities and smaller firms. First, the use of accounting based debt covenants is rare among small and mid-sized firms but much more common among large public firms.¹ Second, a relatively large proportion of non-public firms are likely to be managed by their owners. Separation of ownership and control might exaggerate the incentive to avoid reporting losses (cf. Fundenberg and Tirole, 1995). Accounting-based bonus plans are also likely to be

much more common in public than in non-public firms. Finally, pressure from the market might give public firms the incentive to over-report or smooth out their earnings in order to signal their value (Chaney and Lewis, 1995).

Altogether, one would expect that implicit contracting related arguments are likely to have a greater influence on the accounting choices among non-public firms than among public firms. Although there is extensive literature on earnings management (see Fields et al., 2001 for a review), few studies have focused on settings in which implicit contracting reasons are likely to have a major impact on accounting choices (an exception is Bowe et al., 1995).

A second purpose of the paper is to study the link between auditor characteristics and accounting choices. The role of auditing is to add credibility to financial statements, among others, by ensuring that generally accepted accounting principles have been adhered to when the financial statements have been prepared (Watts and Zimmerman, 1986: 312). The effectiveness of auditing, and its ability to constrain the management of accounting numbers, is likely to vary with the quality of the auditor. Using a Big 6 non-Big 6 dichotomy as the proxy of audit quality, there is also some empirical evidence supporting this view: Francis et al. (1999) found that Big 6 audited firms have lower levels of discretionary accruals than non-Big 6 audited firms. Becker et al. (1998) found that firms audited by Big

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¹ For example, the report of the 'covenant working party' [Kovenantti työryhmä] on p. 33 points out that covenants are basically used for large firms and long term debt in Finland. The Ministry of Industry published the report in 1996.

6 auditors had less income-increasing discretionary accruals than firms audited by non-Big 6 auditors. Discretionary accruals were defined as the unexpected part of total accruals that includes long-term accruals, including depreciation and amortization, as well as short-term accruals.

The management of depreciation and other long-term accruals is likely to be driven by different factors than the management of current accruals. In general, one would expect that the management of long-term accruals would be predominantly driven by factors correlated with the expected leverage and profitability in the long run. Short-term accruals, on the other hand, are likely to be driven by more temporary factors. Few studies have focused explicitly on depreciation as an object of study in the literature on earnings management (an exception here is Holthausen, 1981). In order to capture the more persistent parts of earnings and profitability, two-year averages of the profitability and leverage ratios are used in the main analyses in the paper. However, alternatives are also used in order to test the robustness of the results.

The depreciation policy is measured with depreciation in the income statement in relation to the depreciable assets in the balance sheet. The sample used consists of 1,610 firm-years of data and covers the period between 1996 and 1998. The median assets of the firms are €6.4m (€1=US\$1.13).² Some of the firms in the sample are publicly traded or subsidiaries to publicly traded companies. In order to explore whether the incentives differ between non-public and public firms, results are run for all firms as well as just for the non-public firms in the sample.

The main findings of the paper are as follows: there is a significant negative correlation between the firm's leverage and depreciation in relation to the depreciable assets. This result holds for the entire sample as well as the sub-sample with the non-public firms. Previous literature suggests that firms with a high leverage select income increasing accounting methods mainly in order to avoid covenant violations (e.g. Zmijewski and Hagerman, 1981). However, accounting based covenants are rare among small and mid-sized Finnish firms. Thus, other factors, such as concerns by trade creditors, customers and short-term creditors are likely to contribute to the correlation between leverage and depreciation.

The second set of results in the paper relates to the link between auditors' professional qualifications and depreciation policy. Finland, together with Germany, Sweden, Denmark and some other countries, has a two-tier system for audit qualifications. The training, educational and examination requirements are more demanding for the higher KHT qualification than for the lower HTM qualification. Furthermore, Big 5 audit firms were in-

cluded as a separate category in the analyses.

Big 5 has a positive coefficient in the regressions indicating that the Big 5 audited firms on average depreciate their assets over somewhat shorter periods of time; however, the coefficient was significant only in some of the regressions. A possible reason why Big 5 auditors would require firms to be more conservative when estimating the useful lives of assets is that they have more reputation capital at stake. On a general level, the results agree with Becker et al. (1998) who found that Big 6 audited firms are less likely to report income-increasing accruals, and also with Francis and Krishnan (1999) who found that Big 6 auditors are more conservative in their reporting.

We also tested whether the correlation between the depreciation policy and measures of firms' financial health depend on the auditor type. If Big 5 auditors would be more independent, and thus, unlikely to be unduly influenced by managers, one would expect that the relationship between leverage and depreciation in relation to the depreciable assets is weaker among firms audited by Big 5 auditors. The data did not support this hypothesis, however. On the contrary, some of the results indicated that the correlation is even somewhat stronger among Big 5 audited firms than among firms audited by non-Big 5 KHT auditors.

The remainder of the paper is organised as follows. In the next section we give a brief overview of Finnish accounting and auditing laws. In Section 3 we review the literature and develop the main hypotheses of the paper. Section 4 presents the data used, and Section 5 presents the results of the paper. Section 6 includes some robustness tests and Section 7 concludes the paper.

2. Finnish accounting and auditing laws

Accounting laws: The Finnish Accounting Laws underwent major transformation in 1992 and in 1997. These changes brought the Finnish accounting principles in accordance with the fourth and seventh EU directives. Standards of the International Accounting Standards Board (IASB) also greatly influenced the Finnish accounting principles during the 1990s.

The changes in 1992 brought the depreciation rules close to those in IAS 16 and 38.³ Prior to the

² Exchange rate 21 July, 2003.

³ The basic difference between IAS and the Finnish standards is that IAS gives more detailed guidance; however, there are also some minor differences between the standards. For example, the Finnish rules stipulate that the amortization period for intangible assets should usually not exceed five years (see the Accounting Board's direction 31 May 1993 on p. 5 and the Accounting Act 30 December 1997/1336 ch. 5). The corresponding rule in IAS 38 is 20 years. Furthermore, there is no requirement in Finland that firms should disclose the accumulated depreciation of assets.

reform, depreciation in the financial statements was used as the basis for the calculation of the taxable income. Thus, depreciation was largely influenced by taxation rules. There were no explicit requirements how assets should be depreciated. Thus, it was common that firms with a low net income made no depreciation at all, while more profitable firms frequently used the maximum depreciation percentages that were allowed by the taxation rules.

Since the change in 1992, the costs of tangible as well as intangible assets have been allocated to the periods benefited through depreciation in a systematic way.^{4,5} These rules came into effect for financial statements prepared after the beginning of 1995. The directives of the Finnish Accounting Board permit small firms to use the maximum percentages allowed for taxation purposes as the systematic depreciation in the financial statements.⁶ This rule is optional and distorts the relationship between actual and economically motivated depreciations for small firms.⁷ Small firms, according to the definition in the Accounting Act, are omitted from the empirical analyses below.

No material changes that could affect the results were undertaken in 1997. Indeed, a difference between the 1992 and 1997 Accounting Acts is that the 1997 act specifies the maximum amortisation periods for intangible assets; however, this change was not significant since similar rules were previously included in the directives of the Finnish Accounting Standard Board.

Availability of financial statements: The Company Law currently stipulates that all companies should file their financial statements with the Patent and Registration Office that is a department of the Ministry of Trade and Industry.⁸ These rules came into effect in 1998. Before that, only firms whose size exceeded a prescribed small size had to file their financial statements with the Ministry of Trade and Industry.⁹ If a firm refuses to file their financial statements and more than a year has passed after the day when financial statements should have been filed, a court can force the firm to liquidate. Thus, financial statements for Finnish firms are in principle publicly available for customers, suppliers as well as competitors.

Auditing rules: The Company Law stipulates that all companies should be audited.¹⁰ However, an auditor without a professional qualification in auditing can audit the very smallest companies.

Finland, together with Denmark, Germany, Sweden and some other countries, has a two-tier system of audit qualifications. At least one of the firm's auditors should have the lower HTM qualification if two of the following three requirements are met: (i) the assets are above €0.34m, (ii) net

sales are above €0.68m and (iii) the number of employees exceeds 10. The higher KHT qualification is required if two of the following three conditions are met (i) assets are above €25m, (ii) net sales are above €50m and (iii) the number of employees exceeds 300.

The training, educational and examination requirements for a qualification are specified in the Auditing Act and are more demanding for the KHT qualification. For example, a higher university degree is required for the KHT qualification, while a lower university degree, or a college diploma, is required for the lower HTM qualification. Regional chambers of commerce formally authorise the HTM auditors while the central chamber of commerce authorises the KHT auditors.

Liquidation rules: A final institutional feature worth mentioning is the liquidation rules in the Finnish Company Law. These rules stipulate that a company should initiate liquidation proceedings if losses have consumed the retained earnings and paid in capital to the extent that shareholders' equity is less than half of the share-capital. When the liquidation warning has been triggered, the company has one year to turn things around. If shareholders' equity is less than half the book value of the share-capital when the restructuring period has passed, the firm should liquidate. Firms may therefore be motivated to use income increasing accounting methods in order to reduce the likelihood that the liquidating rules are violated.

⁴ See the Accounting Act, s. 16 (changed 23 December 1992/1572).

⁵ It is still required that depreciation shall be included in the income statement in order to be tax deductible. However, currently the systematic depreciation and the difference between the systematic depreciation and the depreciation for taxation purposes are included on separate lines in the financial statements. We use the sum of the systematic depreciation of tangible assets and systematic depreciation of intangible assets as the measure in our analyses. The difference between the systematic depreciation for financial reporting purposes and the depreciation for taxation purposes is not included in the measure used.

⁶ See The Accounting Board's [Bokföringsnämndens] direction 20 June 1994. The direction from 1994 was replaced in 1999, but also the new standard mentions that small firms can use the maximum depreciation percentage allowed for taxation purposes as the measure of the economically motivated depreciation.

⁷ The rules in effect during the sampling period stipulated that a firm is small if two of the following three conditions are met: (i) its net sales are below FIM 20m (€3.4m), (ii) assets are below FIM 10m (€1.7m) and (iii) the number of employees is below 50. The current size limits are somewhat higher (see the Accounting Act, ch. 3 s. 9).

⁸ Company Law, ch. 11 s. 14 (changed 1997:145).

⁹ The old rules (Company Law, ch. 11 s. 14 (changed 23 December 1992/1,573) stipulated that a company does not need to file its financial statements if two of the following three conditions were met: (i) net sales were below FIM 4m (€0.68m), (ii) total assets were below FIM 2m (€0.34m) or (iii) the number of employees was below 10.

¹⁰ Company Law, ch. 10 s. 1.

3. Hypotheses and approach to testing

3.1. Development of hypotheses

In this section we develop hypotheses linking the firm's financial health and audit quality to the depreciation policies. Several users of financial statements are interested in the economic viability of firms. Bankruptcy prediction studies suggest that measures of profitability, leverage and liquidity give a picture of the firm's financial health (e.g. Ohlson, 1980). We focus on leverage and profitability since common liquidity ratios, such as the current ratio, are not affected by the depreciation policy.

However, before the hypotheses are developed we briefly explain why we use depreciation as the dependent variable although most recent papers use measures of discretionary accruals as indicators of earnings management (see Dechow et al., 1995 for a review). There are two main reasons for this. First, focusing on just one specific accrual item allows us to sharpen the tests and use more finely tuned control variables (Healy and Wahlen, 1999). Second, there are reasons to believe that measurement errors in commonly used discretionary accrual models would be correlated with profitability and leverage. Studies suggest that discretionary accrual models are incorrectly specified if the partitioning variable correlates with performance (e.g. Dechow et al., 1995). Leverage is used as a second partitioning variable here and there are reasons to believe that the measurement error in discretionary accruals also would correlate with leverage. Total accruals are, among other things, affected by changes in inventories, receivables and accounts payable. Thus, an increase in accounts payable will give the impression that the firm has managed earnings downward. However, among firms with a high leverage, perhaps a more plausible reason for high accounts payable is that the firm has had problems in receiving financing and uses trade credit as a last resort of financing (Petersen and Rajan, 1994). The data used for this study shows that there are positive and mostly significant correlations between the firms' leverage and inventory days, receivable days and accounts payable days. The correlations between return on assets and the corresponding measures are negative.¹¹ One would expect that these correlations reflect systematic differences in working capital management between financially weak and financially strong firms rather than earnings management.

The first hypothesis in the study relates to the correlation between the firm's financial health and depreciation. Studies suggest that considerations towards stakeholders, such as customers, suppliers and short term creditors, give firms the incentive to manage earnings, although there are no explicit contracts related to accounting numbers (e.g.

Bowen et al., 1995). For example, creditors lending on a relatively short-term basis will study the health of the firm when loans are about to be extended or renewed. If creditors do not completely adjust accounting numbers for differences in accounting methods, firms having used income increasing accounting methods will be perceived as being less risky, and thus, might be able to borrow on more favourable terms. Suppliers might for similar reasons sell on more favourable terms to firms having used income-increasing accounting methods.

Titman (1984) argues that the financial health of a firm may influence a customer's decision to buy its products. He argues that customers prefer to buy from other producers if they will need future services from the producer, but the likelihood that the firm will exit the business is high. Customers with high switching costs may also prefer to buy from a financially healthy firm rather than being stuck with an obsolete product if the firm would exit the business (Shapiro, 1991: 468). Income-increasing accounting methods may improve the financial image of firms as perceived by customers. Altogether, these arguments suggest that non-public firms with high leverage could have the incentive to use income-increasing accounting methods even if accounting based debt covenants are rare among small and mid-sized firms, as pointed out above.

Furthermore, the liquidation rules in the Finnish Company law give financially troubled firms the incentive to use income-increasing accounting methods. These rules stipulate that a firm should initiate a liquidation if losses have consumed the retained earnings and paid in capital to the extent that shareholders' equity is less than half the book value of the share-capital, as described above.

It is fruitful to distinguish the short-run and the long-run incentives and effects of managing earnings. In the short-run, firms with a higher profitability will be perceived as being less risky by claimants. This will then give firms with a relatively low profitability incentive to use income-increasing accounting methods. However, a possible drawback of displaying high earnings is that an excellent profitability might attract new entrants to the market. Financial statements of Finnish companies must be made publicly available as pointed out above. Thus, firms with an excellent prof-

¹¹ The data used for this paper shows that inventories to sales, receivables to sales and accounts payable to sales are correlated positively and significantly with leverage. The Pearson correlations and p-values are correspondingly 0.086 (<0.001), 0.041 (0.099), and 0.117 (<0.001). The Pearson correlations between inventories to sales, receivables to sales and accounts payable to sales and return-on-assets are correspondingly -0.119 (<0.001), -0.045 (0.069) and -0.202 (<0.001) respectively.

itability have the incentive to use income-decreasing accounting methods in order to deter entrants. High reported profitability might also worsen the firm's bargaining power in price negotiations with its buyers and employees.

Indeed, depreciation of assets over a short period of time is likely to result in lower depreciation charges in the future. However, in the long-run, competition is likely to cut profits for firms with abnormally high profitability. Liquidation of competitors as well as adjustments of the production technology, on the other hand, is likely to improve the profitability of poorly performing firms.¹² There is also empirical evidence supporting the view that earnings follow a mean-reversion process (e.g. Fama and French, 2000). Thus, not only the depreciation charges but also the profitability is likely to reverse in the long-run. The effect of this is that the earnings stream will be less variable if firms with currently relatively poor performance depreciate their assets over longer periods of time than firms with a relatively good performance. Trueman and Titman (1988) point out that firms with a less variable earnings stream are perceived as being less risky.

Based on these arguments we hypothesise that:

H₁: *Ceteris paribus*, firms with lower profitability and higher leverage use depreciation policies that shift reported earnings from future periods to current periods.

The next hypothesis relates to the role of auditing. Auditing has a role in reducing information asymmetry problems between the firm and its stakeholders by improving the reliability of financial statements (e.g. Becker et al., 1998). While auditing is valuable in controlling managerial discretion over accounting choices in general, its value is likely to vary with the quality of the audit firm. Watts and Zimmerman (1986:314) relate audit quality to the competence as well as independence of the auditor, and define audit quality as the joint likelihood that the auditor discovers and reports errors in financial statements, assuming material errors exist.

Becker et al. (1998) suggest that higher quality auditors are expected to be less willing to accept questionable accounting methods and are more likely to detect and report errors and irregularities. Following prior studies, they used a Big 6/non-Big 6 classification as a proxy for audit quality. Their empirical results showed that Big 6 audited firms were less likely to approve income increasing earnings management than firms audited by non-Big 6 auditors. Another study supporting the theory that Big 6 auditors are more conservative is Francis and Krishnan (1999). They found that Big 6 auditors are more likely to issue modified audit reports for high accrual firms than non-Big 6 au-

dited firms, perhaps because they have more reputation capital at risk and thus have the incentive to be more conservative.

If Big 5 audit firms, as well as non-Big 5 auditors with the higher KHT qualification on average, have more reputation capital at risk than HTM auditors and are therefore more conservative, we expect that:

H₂: *Ceteris paribus*, firms audited by Big 5 auditors are more likely to use depreciation policies that shift reported earnings from current periods to future periods than non-Big 5 KHT auditors. And firms audited by HTM auditors are less likely to use accounting methods that shift earnings from current periods to future periods than non-Big 5 KHT auditors.

Our final hypothesis relates to interactions between measures of the firm's financial health, depreciation policies and auditing. If auditors with more reputation capital at risk are more independent and are thus less prone to let firms' self-interest govern depreciation policies, one would expect that the correlation between measures of the firm's financial health and depreciation policies is weaker for firms audited by auditors believed to have more reputation at risk. We therefore present the following hypothesis:

H₃: The correlation between depreciation and measures of profitability and leverage is weaker for firms audited by Big 5 auditors than for firms audited by non-Big 5 KHT auditors. Also, the relationship is stronger for firms audited by HTM auditors than for firms audited by non-Big 5 KHT auditors.

3.2. Approach to testing

The depreciation is measured as the depreciation and amortisation in the income statement in relation to the sum of depreciable assets among tangible and intangible assets before the current year's depreciation and net of accumulated depreciation. A higher value of this ratio indicates that firms use more conservative depreciation policies and thus shift reported earnings from the current period to future periods. If the length of the financial year departed from 12 months, the depreciation was adjusted to correspond with a 12-month long period.

Choices of useful lives of assets influence earnings during a relatively long period of time. Consequently, the depreciation policy is likely to be predominantly influenced by the expected leverage and performance in the long run. The firm's capital structure choice is likely to be rela-

¹² See Kothari (2001: 146) for a further review of the time series properties of earnings and economic reasons for mean reversion in earnings.

tively stable, since static factors such as expected bankruptcy costs are likely to influence the capital structure (e.g. Grinblatt and Titman, 1998 for a review). However, in order to further smooth out possible temporary fluctuations in leverage, two-year averages are used. The main measure of leverage used is the sum of long-term and short-term debt in relation to the sum of liabilities and shareholders' equity. Shareholders equity is calculated as the sum of the book value of equity and untaxed reserves. A long-term debt ratio is used as a complementary measure of leverage. The variables are calculated as the averages of the current year's and the previous year's leverage.

We pointed out above that depreciation policy is likely to be influenced by the expected profitability in the long run. Thus, the measure used should ideally filter out temporary fluctuations in profitability. However, the persistence of earnings is likely to depend on several factors such as the competition within the industry, entrance barriers, exit barriers and the scope of the restructuring activities that a firm needs to undertake in order to adjust to an economically efficient production method. Such factors are difficult to identify; however, in order to capture the more persistent component of earnings we use a two-year average. Cash flow from operations¹³ plus interest expenses divided by total assets is used in the chief analyses of the paper. The advantage of a cash flow based measure over an earnings based measure is that it is a mainly pre-managed. The drawback is that an earnings-based measure could give better indications of future cash flows than a cash flow based measure (Dechow et al., 1998). Return-on-assets is used to test the robustness of the results in complementary analyses in the paper. The ratios are calculated as the average of the current year's and the previous year's ratios. We also test whether the results are sensitive to using the two-year average of the performance and leverage ratio.

The professional qualification of the firm's auditor is measured with dummy variables taking on different values for firms audited by Big 5 auditors, non-Big 5 KHT auditors or HTM auditors. The professional qualifications of the auditors were identified from the Voitto database.¹⁴ The professional affiliation was primarily taken from Voitto. However, if the name of the audit firm was missing from Voitto, the professional affiliation of the auditor was checked with the KHT association's membership list from 1997.¹⁵

The following control variables are included in the regressions. The useful lives of assets are likely to depend on industry factors as well as on what kind of assets the firm has. In particular, firms with more machinery and equipment are likely to depreciate their assets over a shorter period of time

than firms with more buildings. The main measures used to control for this are machinery and equipment in relation to total depreciable assets. The Finnish Accounting Act permits firms to capitalise intangible assets such as research and development costs, start-up costs, goodwill and patents.

We include intangible assets in relation to total depreciable assets in the regressions in order to control for the amount of intangible assets on the results. The Finnish rules stipulate that the amortization period for intangible assets is normally five years but can be up to 20 years.¹⁶ Since these amortization periods are likely to be shorter than the depreciation periods for tangible assets, a positive coefficient on intangible assets in relation to total depreciable assets is expected.

The useful lives of assets may also vary with industry. However, a potential drawback of including industry variables in the regressions is that leverage as well as profitability is likely to depend on industry factors (e.g. Titman and Wessels, 1988). Thus, we present results both with and without controls for industry factors. The industry membership is controlled by using a two-digit industry classification, as described in Table 3.

Depreciation in relation to the depreciable assets is likely to depend on the age structure of the assets. If a firm uses straight-line depreciation, the numerator of the dependent variable will be unaffected by the age of the assets while the denominator will be larger for firms with more newly acquired assets.¹⁷ Indeed, this effect will be less prevalent among firms using accelerated depreciation methods. We include the change in the depreciable assets during a two-year period in the regressions in order to control for this. Since the dependent variable will take on smaller values for firms with more newly acquired assets, a negative coefficient is expected. In our robustness tests we additionally include a capital turnover ratio, and try the three-year change in depreciable assets instead of the two-year change.

¹³ Cash flows from operations were defined as profit before extraordinary items and taxes, plus depreciation, less tax, less increase in current assets (excluding cash and short term investments), less decrease in short term liabilities (excluding short term debts).

¹⁴ The names of the international audit firms in Finland are: KPMP Wideri Oy, Toukko Deloitte & Touch Oy, Tilintarkastajien Oy Ernst & Young, Arthur Andersen Oy, SVH Coopers & Lybrand Oy and Pricewaterhouse Oy (currently SVH PricewaterhouseCoopers Oy).

¹⁵ The membership lists were published by "Keskuskauppanamari" [the Central Chamber of Commerce of Finland] in 1997 and in 2000.

¹⁶ See the Accounting Board's direction 31 May 1993 on p. 5 and the Accounting Act 30 December 1997/1336 ch. 5 for more details.

¹⁷ Accumulated depreciation is not available. Thus, the purchase value of assets cannot be used as the denominator.

Public firms differ from non-public ones in several respects that may have implications for their reporting. Chaney and Lewis (1995) point out that public firms may have the incentive to smooth out earnings as well as report higher earnings than what would be optimal according to a tax minimising strategy in order to signal their value to the market. Managers are less likely to own a significant fraction of the shares in public companies than in private companies. A possible consequence of this is that managers have a greater incentive to avoid reporting losses and thus boost income in bad times and to use income decreasing accounting methods during good times (Fundenberg and Tirole, 1995). Furthermore, one would expect that accounting based debt-covenants and bonus plans would be more common among public firms.

The implications of these factors on the predictions in the hypotheses are ambiguous. However, in order to explore whether the results are different for the subsidiaries and other companies belonging to a group with publicly traded securities than for non-public firms, we include a public dummy variable as well as interactions between a public dummy variable and the leverage, profitability and Big 5 in the regressions.¹⁸

The public dummy variable takes the value one if the firm is a parent company or a subsidiary to a company with publicly traded securities in Finland. The information is taken from Voitto 2001/1. Information about the structure of the financial groups is taken from financial statements. Thus, most of the information used reflects the situation in the end of 1999.¹⁹

The reporting practice may also vary with the size of the firm. First, small firms might for practical reasons try to keep their depreciation for reporting purposes close or equal to the one used for the calculation of taxable income, since this reduces the administrative burden of keeping track of the difference. Larger firms are less likely to be owned by their managers. A possible consequence of this is that fear of dismissal gives managers the incentive to avoid reporting losses, as pointed out above.

Furthermore, accounting-based bonus plans and debt covenants are likely to be more common in larger firms. We use the natural logarithm of assets as the measure of size. The exact calculations of the variables are presented in Table 1.

4. Sample selection and descriptive statistics

4.1. Sample selection

We use data for 1,012 Finnish manufacturing firms and 1,610 firm-years of data for the tests of our hypotheses. Of these, 162 firms and 282 firm-years were either a parent company or a subsidiary to a company with publicly traded securities. The data covers the 1996–1998 period and is taken

from the Voitto-database. This database includes financial statements for firms that either themselves have sent the financial statements to Asiakastieto Oy,²⁰ or that have filed the financial statements with the Patent and Registration Office (PRH). The obligation to file the financial statements with the registration authorities is difficult to supervise.

The sample was obtained as follows. The database included in total 9,285 firm-years of data for manufacturing firms using the income statement classified by nature during 1996 to 1998.^{21,22} Of these, firms with assets below FIM10m (€1.67m) or sales below FIM20m (€3.3m) were excluded leaving us with 2,610 firm years of data. These small firms were omitted since the Finnish accounting rules stipulate that firms whose sales, assets and employees are below a certain size can use the maximum amount of depreciation that is accepted for taxation purposes as depreciation in their financial statements, as described above. Thus, depreciation could be flawed for these firms.

In addition, 868 firm-years were excluded since the database did not include information about the audit report. Furthermore, four firm-years audited by a so-called non-professional auditor (an auditor without a professional qualification in auditing), and seven firm-years audited by KHTs for which it could not be verified whether the auditor was employed by any of the Big 5 companies or not, were

¹⁸ There are advantages as well as disadvantages of using firms' separate financial statements over consolidated financial statements. If firms within a group co-ordinate their accounting choices in order to attain reporting goals at the consolidated level, consolidated reports are likely to be the more relevant ones for firms belonging to a group. However, if the accounting choices are to a large extent influenced by the incentives of division managers, accounts at the subsidiary level are of great interest. The accounts at the individual level are also important for creditors as well as when there is consideration whether the liquidation rules have been violated. Note that for the great majority of the size class of firms studied here, consolidated reports are not prepared.

¹⁹ Indeed, the data describes the situation one to three years after the sampling period. However, since the structure of corporate groups is rather stable in general, we do not think this has any material effects on our results. It is in principle also possible that the sample includes some firms that are subsidiaries to companies with publicly traded securities in other countries than in Finland. However, if there are any such companies in the data they have to be few and cannot materially affect the results.

²⁰ Asiakastieto Oy is a Finnish business and credit information company. Asiakastieto maintains the Voitto database.

²¹ 1996 was the first year during which information about the audit report was included in the Voitto database.

²² An income statement classified by nature is one in which the expenses are classified in term of their nature but not in terms of the purpose of the expenses. Firms that classified operating and other expenses according to the purpose of the expenses and used a functional scheme were omitted since depreciation is in this case not a separate item in income statement. Most small and mid-sized Finnish firms use the so-called natural scheme.

Table 1
Independent variables and their relation to depreciations in relation to the depreciable assets

<i>Variable</i>	<i>Definition</i>	<i>Expected sign</i>
Depreciation / depreciable assets	Depreciation and amortization*/ (depreciation and amortization* + buildings + machinery and equipment + other tangible assets + pre-opening and start-up costs + research and development + goodwill + some other intangible assets (e.g. patents, computer software)	
Two-year cash flow	(Profit before extraordinary items and taxes + depreciation - tax - increase in current assets (excluding cash and short term investments), - decrease in short-term liabilities (excluding short term debts) + interest expenses) / total assets. Calculated as a two-year average.	+
Two-year leverage	(Total liabilities – accounts payable, accrued expenses and advances) / (total liabilities – accounts payable, accrued expenses and advances) + total shareholders' equity + appropriations (e.g. accumulated depreciation over plan and voluntary reserves). Calculated as a two-year average.	-
Machinery & equipment / depreciable assets	Machinery and equipment / (buildings + machinery and equipment + other tangible assets (e.g. stone pits) + pre-opening and start up costs + research and development + goodwill + some other intangible assets (e.g. patents, computer software)	+
Intangible assets / depreciable assets	Pre-opening and start up costs + research and development + goodwill + some other intangible assets (e.g. patents, computer software) / (buildings + machinery and equipment + other tangible assets (e.g. stone pits) + pre-opening and start-up costs + research and development + goodwill + some other intangible assets (e.g. patents, computer software). A square-root transformation of the ratio is used.	+
Two-year change in assets	Increase in depreciable assets during a two-year period, in relation to the depreciable assets two years prior to the analysed year.	-
Public	A dummy variable taking the value one if the company belongs to a group with publicly traded securities and zero otherwise. The dummy variables take the value one also if the corresponding firm is a subsidiary to a public company	?
Lnassets	Natural logarithm of total assets	?
Industry dummy variables	Two-digit industry codes as presented in table 3.	?
HTM, non-Big 5 KHT, Big 5	Big 5 takes the value one if the firm was audited by an auditor from any of the Big 5 audit firms and zero otherwise. Correspondingly, non-Big 5 KHT takes the value one if the firm was audited by an auditor with the KHT qualification not employed by a Big 5 firm and HTM takes the value one if the firm was audited by a non-Big 5 auditor with the HTM qualification.	Positive on Big 5 and negative on HTM. Non-Big 5 KHTs are in the reference group.

*Adjusted to correspond with a 12-month long period.

Table 2
Financial characteristics of the firms

<i>Variable</i>		<i>HTM</i>	<i>Median</i>	<i>Non-Big 5 KHT</i>	<i>Median</i>	<i>Big 5</i>	<i>Median</i>	<i>F test (Equality of means)</i>
Sales (in €000)		7,742.02	5,950.22	11,312.38	6,948.96	52,060.07	12,527.92	12.77 **
Assets (in €000)		4,666.63	3,409.35	7,896.85	4,671.63	65,391.38	8,446.01	4.24 *
Two-year cash flow		0.16	0.16	0.16	0.15	0.15	0.14	0.51
Two-year leverage		0.48	0.49	0.49	0.49	0.47	0.47	0.29
Intangible assets / depreciable assets		0.15	0.11	0.17	0.15	0.24	0.18	35.24 **
Two-year change in assets		0.60	0.24	0.42	0.15	0.29	0.03	7.64 **
Machinery & equipment / depreciable fixed assets		0.53	0.51	0.51	0.50	0.54	0.53	2.34
Depreciation and amortisation / depreciable fixed assets		0.14	0.13	0.14	0.13	0.16	0.14	6.61 **

* Indicates statistical significance at the 0.05 level
 ** Indicates statistical significance at the 0.01 level

Table 3
Industry distribution of the firms

<i>Industry classification (TOL - Code)*</i>	<i>HTM</i>	<i>Non-Big 5 KHT</i>	<i>Big 5</i>	<i>Total</i>
Food products and beverages (15)	47	45	108	200
Textiles (17)	4	5	16	25
Apparel (18)	0	2	36	38
Leather products (19)	1	8	15	24
Wood and wood products (20)	21	33	93	147
Pulp, paper and paper products (21)	1	4	63	68
Printing and publishing (22)	8	32	133	173
Chemicals and allied products (24)	0	1	51	52
Rubber and plastic products (25)	15	20	55	90
Stone, clay and glass products (26)	10	11	33	54
Primary metal industries (27)	1	1	31	33
Fabricated metal products (28)	27	49	81	157
Machinery and equipment (29)	26	52	169	247
Computer and office equipment (30)	0	2	1	3
Electronic and other electric equipment (31)	6	14	55	75
Audio and video equipment; electronic components and accessories (32)	6	7	29	42
Medical instruments and supplies, optical instruments and clocks (33)	1	6	45	52
Motor vehicles and equipment (34)	4	15	27	46
Other vehicles (35)	9	5	13	27
Furniture; miscellaneous manufacturing (36)	11	16	30	57
Total	198	328	1084	1610

Notes:

*According to the classification of Statistics Finland 1995. This classification is based on the EU standard from 1990

excluded from the analyses. Financial data two years before the analysed year is needed for the calculation of the ratio two-year change in assets. This resulted in an omission of 88 cases. Since the techniques used for estimation (OLS and GLS) are rather sensitive to outliers, the two-year change in assets ratio was trimmed at the one percent level, leaving us with 1,610 observations. A square-root transformation of intangible assets / depreciable assets was used in order to reduce the impact of outliers. The other variables did not have any significant extreme values.

The data used is probably not totally representative for the whole population of firms. It is difficult for the registration authorities to supervise whether all firm that should file the financial statements actually have fulfilled their obligation to do so. Thus, firms with a strong incentive to conceal their performance and leverage, such as failing firms, are likely to be under-represented in the sample. Smaller firms are also more likely to be missing since the registration authorities are less likely to observe their failure to file the financial statements.

However, firms with a strong incentive to conceal its performance do also have a strong incen-

tive to manage its earnings. Thus, even if it is difficult to predict the effect, one would rather expect that the correlation between depreciation policy and independent variables is weaker than if a more representative sample would have been used.

4.2. Descriptive statistics

This sampling procedure yielded a sample with 204 firm-years audited by an HTM-auditor and 1,406 firm-years audited by a KHT auditor. Of these, a Big 5 KHT audited 1,078 firm-years and a non-Big 5 KHT audited 328 firm-years. In six cases, an HTM auditor employed by any of the Big 5 firms audited the firm.²³

Table 2 compares the financial characteristics of the firms audited by the HTM, the non-Big 5 KHT and the Big 5 auditors. A F-test is used to test whether the average values of the financial characteristics differ between the firms audited by different auditor types. Table 3 displays the industry distribution.

It can be seen from Table 2 that the firms audit-

²³ The six firms that were audited by HTM auditors employed by any of the Big 5 firms were coded as Big 5 in the analyses.

Table 4
Pair wise correlations between the variables

	Square root of depreciation /depreciable assets	Two-year cashflow /depreciable assets	Two-year change in assets	Lnassets	Intangible assets /depreciable assets	Machinery & equipment /Depreciable Fixed assets	Two-year leverage
Square root of depreciation /depreciable assets	1.000						
Two-year cash flow	0.118**	1.000					
Two-year change in assets	-0.132**	-0.006	1.000				
Lnassets	-0.149**	-0.071**	-0.013	1.000			
Intangible assets / depreciable assets	0.351**	0.005	-0.034	0.088**	1.000		
Machinery & equipment / depreciable fixed assets	0.412**	0.095***	0.045	-0.022	-0.138**	1.000	
Two-year leverage	-0.083**	-0.173**	-0.041	-0.175**	0.056*	-0.042	1.000

* Indicates statistical significance at the 0.05 level
 ** Indicates statistical significance at the 0.01 level

ed by Big 5 auditors are significantly larger than the firms audited by non-Big 5 KHT auditors. The median sales of the firms audited by Big 5 auditors is €12.5m. The corresponding figure is €6.9m for the firms audited by non-Big 5 KHT. The median sales of the firms audited by auditors with the lower HTM qualification is €6.0m.

Table 2 shows that there are no significant differences in two-year-leverage. The average leverage is around 50% for all three categories studied. The table also shows that the firms audited by Big 5 auditors have a slightly lower two-year-cashflow than the firms audited by the two other types of auditors.

Furthermore, the table compares the depreciation / depreciable assets. The average figures are 14% for the firms audited by HTM auditors and for the firms audited by non-Big 5 KHT auditors. The corresponding average is 16% for the firms audited by Big 5 auditors. The difference in means is significant between the Big 5 audited firms and non-Big 5 KHT audited firms as well as between Big 5 audited firms and HTM audited firms. The p-values for t-tests are respectively 0.002 and 0.0256.

There are some differences in the asset structure between the firms that are likely to influence the comparison of depreciation to the depreciable assets. In particular, it can be seen that the Big 5 audited firms have more intangible assets than the non-Big 5 KHT and HTM audited firms. Furthermore, the Big 5 auditors have somewhat larger values of machinery and equipment. Machinery and equipment typically have shorter useful lives than buildings implying that a higher value of depreciation / depreciable assets can also be expected for the Big 5 audited firms. In the analyses below we take this into account.

In 1993, Finland adopted rules according to which assets should be systematically depreciated over their useful lives. The rules came into effect in 1995 and are described in more detail above. As a consequence, most firms chose depreciation methods for not only newly acquired assets but also for all their assets around 1995. Since the financial state of firms in 1995 in most cases is close to the financial state during the years studied here, the link between depreciation and the incentive related variables might be stronger in this study than in general. That is, a setting in which firms can influence the depreciation of only currently acquired assets.

5. Results

Two types of estimation strategies are considered. In the more elementary models we treat all observations identically and perform OLS on the entire data set. Panel data regression models are included as an alternative, since our data set is a combina-

tion of cross-sectional and time-series observations.²⁴ The panel data regression models presented are random effects models with a one-way error component. This means that we allow for firm-specific random effects.²⁵

The pair-wise Pearson correlations between the variables are presented in Table 4 and the regression results are presented in Tables 5 and 6. Table 5 includes the results for all observations and Table 6 includes the results for the sub-sample of non-public firms. The OLS regressions are in the left-hand panel and the Random Effect models are in the right-hand panels of Tables 5 and 6.

The square root of depreciation/depreciable assets is used as the dependent variable. The square root transformation is used to make the distribution of the dependent variable closer to the normal distribution and in this way improves the statistical properties of the model.

Hypothesis one predicts a negative sign for two-year leverage and a positive sign for two-year-cashflow. Since leverage and profitability in part depend on industry factors, and industry dummies may capture a part of this effect, we present results with and without industry dummy variables. This hypothesis is tested in regressions one, two, five and six in Tables 5 and 6.

The coefficient of two-year leverage has the predicted negative sign in all regressions. The coefficients are significantly different from zero at the 0.01 level in all regressions other than regressions three and seven in Tables 5 and 6.²⁶ The results were close to the reported ones when the current year's leverage instead of the two-year average was used (unreported). Furthermore, the interaction between two-year leverage and public shows that there are no significant differences in the correlation between leverage and the dependent variable between non-public firms and subsidiaries and other companies belonging to a group with publicly traded securities.

²⁴ The panel is unbalanced. When estimating the parameters and their variances we have used the generalisation for unbalanced data by Baltagi (1985).

²⁵ The choice between random effects and fixed effects models, where the firm-specific effects are assumed to be fixed, does not seem to be clear-cut. The random effects approach was adopted since the use of fixed effects would lead to a substantial loss of degrees of freedom.

²⁶ In order to study whether the correlation between two-year leverage and the dependent variables is driven by firms with high leverage, we tried to re-estimate the models for different quartiles of leverage. If for example concerns about the liquidation threat would drive the results, one would expect a stronger correlation among highly levered firms. The results did not reveal any such pattern, however. The coefficients of the leverage ratio in a regression with the same variables as in regression one in Table 5 were almost similar (ranging between -0.09 and -0.11) for the three lower quartiles of leverage, but were only -0.02 in the quartile with the highest leverage.

It can be seen from the tables that two-year cash flow has positive (albeit insignificant) coefficients in the regressions. The positive sign of the interaction between public and two-year cash flow indicates that the correlation between the performance measure and the dependent variables is stronger for public firms than for non-public firms, although not significantly so. The results were largely unchanged when the current year's cash flow was used instead of the two-year average.

Following Becker et al. (1998) and Francis et al. (1999), we predicted in hypothesis two that the auditor type affects depreciation policies. Becker et al. argue that high quality auditors with a lot of reputation capital at stake have the incentive to be more conservative than lower quality auditors, and thus, more frequently require firms to use income decreasing accounting methods.

The hypothesis is tested in regressions one, two, five and six in the tables.²⁷ Firms audited by non-Big 5 KHT auditors are in the reference group. Thus, a positive coefficient of an auditor type variable indicates that the dependent variable takes on higher values for the corresponding type of auditor than for non-Big 5 KHT auditors. This implies that hypothesis two predicts a positive sign for the Big 5 dummy variable and a negative sign for the HTM dummy variable. Big 5 have positive and significant coefficients at the 0.05 levels in the random effects models in regressions five and six in Tables 5 and 6. The variable was significant at the 0.10 level in regressions one and two in Table 5 but insignificant in the corresponding regressions in Table 6.

The positive sign of the interaction between Big 5 and public suggest that Big 5 audited public companies use shorter depreciation periods than firms audited by the other types of auditors. However, the coefficient of the interaction is insignificant and only 20 of the firm-years of the public companies were audited by non-Big 5 auditors. The coefficients of Big 5 were significant at the 0.05 level also in regressions one and two in Table 5 as the interaction between Big 5 and public was omitted.

Hypothesis three focuses on interactions between measures of the firm's financial health, depreciation policies and auditing. If auditors with more reputation capital at risk were more independent and therefore less prone to let firms' self-interest govern depreciation policies, one would expect that the correlation between measures of the firm's financial health and depreciation policies is weaker for firms audited by auditors believed to have more reputation at risk.

Interactions between the auditor type variables and the measures of the firms' financial health are used to study the hypothesis. Regressions three and seven explore the correlation between lever-

age and the dependent variables for the different auditor types, and regressions four and eight focus on the correlation between performance and the dependent variable.

If the correlation between depreciation / depreciable assets and two-year leverage is weaker for firms audited by Big 5 auditors, one would expect that the interaction between two-year leverage and Big 5 has a positive coefficient. Consequently, negative coefficients on the interactions between two-year cash flow and Big 5 are expected. Reversed signs are expected for the interactions between HTM and the measures of the firm's financial health.

The data do not support these predictions, however. The interactions between two-year leverage and HTM as well as the interactions HTM and two-year cash flow were all insignificant in the regressions. The interactions between Big 5 and two-year cash flow were also insignificant in the tables. Finally, the interaction between two-year leverage and Big 5 is insignificant in most of the regressions but significant at the 0.05 level in the random effects models in Tables 5 and 6. However, the interaction has a negative sign implying that the correlation between leverage and the dependent variable is stronger, not weaker, among firms audited by Big 5 auditors than among firms audited by non-Big 5 KHT auditors.

6. Robustness tests

Some other models were explored in order to test the robustness of the main results of the paper. Variants of regressions one, two, five and six were used to test hypotheses one and two, and variants of regressions three, four, seven and eight were used to test hypothesis three.

First, we tried to include total assets in relation to sales as a further control for the age structure of the assets. Arguably, firms with older assets are likely to have higher asset turnover ratios, since the book values of the assets are then lower. The asset turnover ratio has positive coefficients with t-values between six and nine in the regressions.²⁸ Two-year leverage is still significant at the 0.01 level. Big 5 is now significant at the 0.10 level in regressions five and six in Tables 5 and 6 but insignificant in regressions one and two. The interactions between two-year leverage and Big 5 were

²⁷ Note that it is difficult to interpret the auditor type variables in regressions three, four, seven and eight since the auditor type variables are then interacted with two-year leverage and two-year cash flow. The significances of htm and big 5 then reflect a situation when two-year leverage and two-year cash flow are zero.

²⁸ This ratio was not included in the main analyses since the asset turnover correlates with return-on-assets (cf. Stickney and Brown, 1999: 554). Thus, inclusion of the ratio might also have affected the significance of two-year cash flow.

Table 5
OLS regressions in panel A and random effect regressions in panel B. The sample includes 1,610 firm-years of data for non-public as well as public firms.
Variables are explained in Table 1. T-values in parentheses

	<i>Predicted sign</i>	<i>Panel A – OLS regressions</i>				<i>Panel B – Random effect models</i>			
		1	2	3	4	5	6	7	8
Intercept		0.424 (23.094)***	0.419 (21.687)***	0.407 (20.270)***	0.412 (20.321)***	0.447 (20.056)***	0.438 (18.696)***	0.423 (17.336)***	0.431 (17.992)***
Two-year cash flow	+	0.012 (0.740)	0.008 (0.501)	0.023 (1.627)	0.045 (1.069)	0.014 (0.847)	0.011 (0.675)	0.019 (1.323)	0.054 (1.359)
Two-year change in assets	-	-0.012 (-7.293)***	-0.013 (-8.180)***	-0.013 (-8.181)***	-0.013 (-8.264)***	-0.010 (-7.813)***	-0.011 (-8.305)***	-0.011 (-8.277)***	-0.011 (-8.416)***
Lnassets	?	-0.014 (-9.111)***	-0.014 (-8.862)***	-0.014 (-8.996)***	-0.014 (-8.934)***	-0.015 (-8.037)***	-0.015 (-7.802)***	-0.015 (-7.889)***	-0.015 (-7.864)***
Machinery & equipment / depreciable fixed assets	+	0.161 (23.654)***	0.160 (23.529)***	0.160 (23.484)***	0.160 (23.457)***	0.147 (19.011)***	0.145 (18.671)***	0.145 (18.630)***	0.141 (12.633)***
Two-year leverage	-	-0.044 (-6.336)***	-0.034 (-4.904)***	-0.012 (-0.829)	-0.030 (-4.653)***	-0.043 (-5.289)***	-0.035 (-4.239)***	-0.004 (-0.268)	-0.032 (-4.239)***
Intangible assets / depreciable assets	+	0.203 (21.428)***	0.175 (17.687)***	0.175 (17.738)***	0.175 (17.745)***	0.165 (15.174)***	0.165 (12.520)***	0.140 (12.596)***	0.141 (12.633)***
Public	?	-0.048 (-2.503)*	-0.041 (-2.208)*	-0.002 (-0.462)	-0.02 (0.432)	-0.030 (-1.388)	-0.027 (-1.257)	0.002 (0.309)	0.002 (0.325)
HTM*	-	0.001 (0.114)	0.002 (0.372)	0.012 (0.942)	-0.004 (-0.343)	0.004 (0.503)	0.006 (0.807)	0.016 (1.145)	0.003 (0.245)
Big 5*	+	0.008 (1.791)	0.009 (1.836)	0.022 (2.450)*	0.015 (1.859)	0.013 (2.319)*	0.013 (2.346)*	0.033 (3.276)**	0.022 (2.574)*
Two-year cash flow * public	?	0.050 (1.536)	0.054 (1.679)	-	-	0.021 (0.644)	0.026 (0.828)	-	-
Two-year leverage * public	?	0.027 (1.429)	0.023 (1.207)	-	-	0.013 (0.578)	0.011 (0.506)	-	-
Big 5 * public	?	0.023 (1.379)	0.023 (1.380)	-	-	0.021 (1.01)	0.022 (1.166)	-	-

Table 5
OLS regressions in panel A and random effect regressions in panel B. The sample includes 1,610 firm-years of data for non-public as well as public firms.
 Variables are explained in Table 1. T-values in parentheses (continued)

	<i>Panel A – OLS regressions</i>				<i>Panel B – Random effect models</i>				
	<i>Predicted sign</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
Two-year leverage * Big 5*	+	–	–	-0.024 (-1.533)	–	–	–	0.039 (-2.173)*	–
Two-year leverage * HTM*	–	–	–	-0.018 (-0.816)	–	–	–	-0.020 (-0.799)	–
Two-year cash flow * Big 5*	–	–	–	–	-0.034 (-0.771)	–	–	–	-0.048 (-1.138)
Two-year cash flow * HTM*	+	–	–	–	0.040 (0.698)	–	–	–	0.018 (0.315)
Industry dummies	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Adjusted R-squared	40.80%	43.72%	43.62%	43.66%	–	–	–	–	–
F statistic	93.42**	41.31**	42.50**	42.56**	–	–	–	–	–

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

* Non-Big 5 KHT auditors are in the reference category.

Table 6
OLS regressions in panel A and random effect regressions in panel B. The sample includes 1,328 firm-years of data for non-public firms. Variables are explained in Table 1. T-values in parentheses

	Predicted sign	Panel A – OLS regressions				Panel B – Random effect models			
		1	2	3	4	5	6	7	8
Intercept		0.411 (18.211)**	0.419 (17.917)**	0.411 (17.037)**	0.413 (16.886)**	0.431 (15.835)**	0.437 (15.482)**	0.424 (14.536)**	0.431 (14.954)**
Two-year cash flow	+	0.011 (0.629)	0.006 (0.330)	0.006 (0.332)	0.042 (0.941)	0.013 (0.779)	0.011 (0.613)	0.011 (0.649)	0.047 (1.121)
Two-year change in assets	-	-0.012 (-6.983)**	-0.013 (-7.382)**	-0.013 (-7.334)**	-0.013 (-7.371)**	-0.010 (-7.460)**	-0.010 (-7.736)**	-0.010 (-7.644)**	-0.010 (-7.735)**
Lnassets	?	-0.013 (-6.873)**	-0.014 (-7.218)**	-0.014 (-7.265)**	-0.014 (-7.143)**	-0.014 (-6.013)**	-0.015 (-6.319)**	-0.015 (-6.333)**	-0.015 (-6.285)**
Machinery & equipment / depreciable fixed assets	+	0.171 (22.626)**	0.167 (21.789)**	0.167 (21.785)**	0.166 (21.750)**	0.156 (18.054)**	0.156 (17.193)**	0.150 (17.207)**	0.149 (17.166)**
Two-year leverage	-	-0.043 (-6.030)**	-0.034 (-4.644)**	-0.015 (-1.008)	-0.034 (-4.631)**	-0.043 (-5.097)**	-0.034 (-4.038)**	-0.007 (-0.441)	-0.034 (-3.990)**
Intangible assets / depreciable assets	+	0.203 (19.173)**	0.178 (15.830)**	0.178 (15.878)**	0.178 (15.878)**	0.168 (13.948)**	0.144 (11.381)**	0.144 (11.448)**	0.144 (11.443)**
HTM ^x	-	0.001 (0.216)	0.002 (0.301)	0.010 (0.760)	-0.004 (-0.315)	0.004 (0.465)	0.005 (0.645)	0.013 (0.847)	0.001 (0.107)
Big 5 ^x	+	0.008 (1.610)	0.008 (1.619)	0.020 (2.155)*	0.017 (1.888)	0.012 (2.046)*	0.012 (2.080)*	0.030 (2.854)**	0.021 (2.245)*
Two-year leverage * Big 5 ^x	+	-	-	-0.026 (-1.540)	-	-	-	0.038 (-2.050)*	-
Two-year leverage * HTM ^x	-	-	-	-0.017 (-0.707)	-	-	-	-0.016 (-0.612)	-
Two-year cash flow * Big 5 ^x	-	-	-	-	-0.059 (-1.210)	-	-	-0.056 (-1.216)	-

Table 6
 OLS regressions in panel A and random effect regressions in panel B. The sample includes 1,328 firm-years of data for non-public firms. Variables are explained in Table 1. T-values in parentheses (continued)

	Panel A - OLS regressions				Panel B - Random effect models			
	1	2	3	4	5	6	7	8
Two-year cash flow * HTM*	+	–	–	0.033 (0.538)	–	–	–	0.018 (0.314)
Industry dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Adjusted R-squared	41.03%	43.32%	43.34%	43.33%	–	–	–	–
F statistic	116.39**	38.57**	36.00**	36.15**	–	–	–	–

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

* Non-Big 5 KHT auditors are in the reference category.

insignificant in regressions three and seven in the tables.

Next, we replaced the two-year change in assets with a change in assets over a three-year period. This reduced the sample size from 1,610 to 1,030.²⁹ Big 5 had now positive but insignificant coefficients. Two-year leverage was still significant at the 0.01 level in the regressions testing hypothesis one. The interaction between two-year leverage and Big 5 were again insignificant in regressions three and seven in the tables.

Third, in order to check whether the results depend on the leverage measure used we tried to replace the leverage ratio used in Tables 5 and 6 with the two-year average of a long-term debt ratio.³⁰ Also, this ratio was significant at the 0.01 level in regressions one, two, five and six in Tables 5 and 6. Big 5 was now significant at the 0.01 level in regressions five and six and significant at the 0.10 level in regressions one and two in Table 5. Big 5 was significant at the 0.05 level in regressions five and six in Table 6. The interaction between two-year leverage and Big 5 had a negative sign and was significant at the 0.10 level in regression seven in Table 5 and significant at the 0.05 level in the regression in Table 6.

We used cash flow before interest expenses as the performance measure in the analyses above. A possible disadvantage of this is that the performance after interest payments is the key object of firms' earnings management activities. However, also the two-year average of cash flow after interest expenses in relation to total assets turned out to be insignificant in the regressions.

We then replaced two-year cash flow with a two-year average of return-on-assets. This ratio turned out to have positive coefficients and it was significant at the 0.10 level in regression one in Table 5. Big 5 was significant at the 0.10 level in regressions one and two, and at the 0.01 level in regressions five and six in Table 5. It was significant at the 0.05 level in regression five and six in Table 6. Two-year leverage was significant at the 0.01 level in Table 5 as well as Table 6. The interaction between return-on-assets and Big 5 had the predicted negative sign and was significant at the 0.05 level in regression four in the tables.

Finally, we studied models in which we controlled for the asset structure with buildings in relation to the depreciable assets instead of machinery and equipment. This ratio had, as one could expect, negative coefficients in the regressions. Again, two-year leverage was significant at

the 0.01 level in Tables 5 and 6 in regressions one, two, five and six. Big 5 had a positive coefficient as in the other regressions and was significant at the 0.05 level in regressions five and six in Table 5 and significant at the 0.10 level in regression five and six in Table 6. The interaction between two-year leverage and Big 5 had a negative sign and it was significant at the 0.05 level in regression seven in Tables 5 and at the 0.10 level in regression seven in Table 6.

To conclude, the tests show that the negative and significant correlation between leverage measures and the dependent variable is robust for alternative specifications of the model. The results also show that there is a positive correlation between Big 5 and the dependent variable, although not significant in some of the analyses. This correlation seems to be somewhat stronger for public firms than for the non-public ones. Finally, the coefficient of the interaction between the two-year leverage and Big 5, that showed up to be negative and significant in Table 5, is insignificant in most of the alternative models explored here.

7. Summary and conclusions

The study examines the correlation between measures of firms' financial health, auditor type variables and the depreciation policy for a sample with 1,610 firm-years of data. Firms with a higher leverage and lower performance are likely to use income increasing accounting methods since it improves the financial image of the firm as perceived by creditors and other stakeholders. We found a negative and significant correlation between leverage and depreciation in relation to the depreciable assets, indicating that highly levered firms depreciate their assets over shorter periods of time than firms with a lower leverage. This result holds for a sub-sample with non-public firms as well as a mixed sample with public and non-public firms. Previous literature suggests that firms with a high leverage select income-increasing accounting methods in order to avoid debt covenant violations (e.g. Zmijewski and Hagerman, 1981). However, accounting information-based covenants are rare among small and mid-sized Finnish firms. Thus, implicit contracting reasons, such as concerns by trade creditors, customers and short-term lenders are likely to contribute to the correlation. If creditors do not fully adjust accounting numbers for differences in accounting methods, firms having used income increasing accounting methods will be perceived as less risky and thus might be able to borrow at more favourable terms. However, we did not find any significant correlation between performance, measured with cash flow from operations, and depreciation in relation to the depreciable assets.

Following Becker et al. (1998), we predicted

²⁹ The variable had quite a few extremely large values. Thus, the 5% of the cases with the largest values were omitted from the analyses.

³⁰ Calculated as long-term debt in relation to the sum of long-term debt and shareholders' equity (including untaxed reserves).

that firms audited by higher quality auditors are more conservative and therefore more likely to use income-reducing accounting methods. The professional qualifications of the auditors were used as the measure of audit quality. The data gave partial support for this hypothesis. In most of the regressions we found that the depreciation in relation to the depreciable assets was on average higher among firms audited by Big 5 auditors than non-Big 5 KHT auditors. However, we found no significant difference between firms audited by the lower HTM qualification and non-Big 5 KHT auditors.

A final issue studied in the paper is whether the correlation between measures of the firm's financial health and the depreciation policy depends on auditor characteristics. Based on the notion that Big 5 auditors have more reputation capital at stake, it was predicted that the correlation would be weaker for Big 5 audited firms than non-Big 5 KHT audited firms. Furthermore, it was suggested that the correlation would be weaker among firms audited by non-Big 5 KHT than among firms audited by HTM auditors. The results did not support these predictions, however.

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Accounting and management discourse in proto-industrial settings: the Venice Arsenal in the turn of the 16th century

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Abstract—This paper investigates managerial ideas and accounting notions developing at the Venetian state shipyard, the *Arsenale*, in the turn of the 16th century, with three major elements of interest. First, it shows the existence of rather sophisticated managerial and accounting discourse in the Renaissance period, where modern forms of management through accounting can be highlighted inside the 'Venetian method'. Second, it allows for an understanding of the evolution of accounting discourse over time: in the particular time span under investigation (1580–1643) new concepts and notions emerged, coupled with new ways of talking about managing issues through emerging accounting concepts (the invention of the idea of work in progress; costing expertise and other calculative practices). Third, it shows how a modern form of economic discourse gradually established itself in the face of hostile social and moral norms. The event under investigation describes a process in which the formal meaning of the economic (Polanyi, 1977) took place, with its associated moral imperative of organising and economising, conflicting to a large extent with social order. Though the term efficiency never appears in the documents, its ethos and pathos are there, fostered by accounting and discourse about managing.

1. The Venice Arsenal in accounting history: an European focus?

This paper draws attention to a potentially significant moment in the history of accounting and management, which has not previously been addressed from an accounting perspective. It concerns the extent to which managerial ideas and accounting notions were developed at the Venetian state shipyard, the *Arsenale* (hereafter 'Arsenal'), at the turn of the 16th century. The paper offers an analysis of the prevailing managing and accounting practices of the Arsenal at the time, and of certain innova-

tions and proposals for reform that took place over the period 1580–1643, after the Lepanto battle, 1571. The material reviewed here provides some evidence that relatively sophisticated ideas and discourses were developed over this period in terms of managerial and accounting-based approaches to production, and it therefore raises important questions in relation to the debate over the 'genesis' (or better: early examples) of modern management, and the role played by accounting and notions of accountability.

This debate has typically focussed on developments some two centuries later, associated with the so-called Industrial and Managerial Revolutions in Britain and the US (see for all Pollard, 1965; Chandler, 1977). Without any aim of questioning the significance of these two turning points of historical discontinuity – marking the transition in the history of modernity, promoting, if in differing ways, the definitive emergence of an economic and political world dominated by managerialist business oligopolies and large state apparatuses – possible controversies nonetheless can be found.¹

In the British case, it has been questioned that there are no clear instances of organisations where

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¹ See some of the available literature reviews and special issues in major accounting journals such as *Accounting, Organisations and Society*, 1991; *Accounting, Auditing and Accountability Journal*, 1996; *Critical Perspectives in Accounting*, 1998; *Accounting and Business Research*, 2002; *The European Accounting Review*, 2002. More particularly see: Miller et al., 1991; Stewart, 1992; Miller and Napier, 1993; Carnegie and Napier, 1996; Funnell, 1996; Boyns and Edwards, 1996; Gaffikin, 1997; Merino, 1997; Carmona and Zan, 2002).

accounting was deployed to engineer administrative co-ordination across the whole enterprise, or to produce the kind of performativity which simultaneously controlled worker time and activity, via forms of 'human accounting' (Fleischman and Parker, 1990; Fleischman and Tyson, 1993; Fleischman, Hoskin and Macve, 1995; Edwards and Newell, 1990; Boyns and Edwards, 1996, 1997; Tyson, 1998). In the American case, while it appears that a distinctive form of managerialism was developed from around 1850 along the lines suggested by Chandler (1977, 1986), with the 'invisible hand' of the market displaced by the 'visible hand' of management, serious questions remain about the provenance of the new managerial world (e.g., Hoskin and Macve, 1988, 1994). For the techniques identified by Chandler as constituting 'administrative co-ordination' – i.e. book-keeping, recording, tracking cost, time and productivity, along with organisation charts – were not introduced by businessmen in response to narrow economic or technological demands, and indeed were not purely 'administrative' inventions (cf. Hoskin and Macve, 1988, and the West Point Connection), borrowed from other domains (Miller and Napier, 1993: 532).

Beyond the various different positions held, however, one of the aspects characterising recent developments in accounting history (and the New Accounting History) is the tracing back of the emergence of meaningful particularly forms of modern managerial control some decades backwards, in the 18th century (e.g., Hopwood, 1987, 1992; Mepham, 1988; Fleischman and Parker, 1991; Edwards and Boyns, 1992; Bhimani, 1994; Scorgie, 1997; Fleischman and Macve, 2002)). This look into early examples can change our mind about what constitutes 'modern' aspects, affecting only current day management and accounting practices (Parker, 1981; Zan, 2001; Carnegie and Napier, 2002).

As a consequence – to some extent unanticipated and not totally understood by genealogists² – moving back the time frame is also likely to call for a change of focus at the logical as well the geographical level: for important antecedents can be seen in other kinds of organisations besides firms (churches, arms, state-run factories etc.), with the role played by European State-bureaucracies wor-

thy of more attention than what it actually receives in the literature (Nikitin, 1996; Carmona et al., 1997; Jones, 1998; Carmona and Zan, 2002; Alvarez-Dardet et al., 2002; Donoso, 2002. Cf. also Jones, 1997).

Following on from that more European focus which could foster an international view of accounting history (cf. Zan, 1994; Zambon, 1995; Carnegie and Napier, 2002; Richardson and MacDonald, 2002), yet here looking almost two centuries earlier, one discovers a particularly visionary set of accounting and management innovations being either proposed or introduced in the Venice Arsenal, with at least three major elements of interest.

First, it shows the existence of rather sophisticated managerial and accounting discourses in the Renaissance period, where modern forms of management through accounting can be highlighted inside the 'Venetian method' (for instance the approach to what we call in today's terminology organisational design proposal; the introduction of budgeting logic and the use of bargaining mechanisms if not objectives); what is particularly interesting to notice is the practices of 'giving account' on what was going on at the Arsenal through the widespread use of reports on operations and managing issues.

Second, it allows for an understanding of the evolution of accounting discourse over time: in the particular time span under investigation (1580–1643) the growth of new concepts and notions can clearly be picked out ('accounting becoming what it was not', as put by Hopwood, 1987: 207), together with an ability to talk about managing issues through newly developed accounting concepts (for instance, as we will see, the invention of the idea of work in progress; or costing expertise in this period).

Third, and of great interest, it shows how a modern form of economic discourse gradually established itself in the face of hostile social and moral norms. The period under investigation in this sense is a kind of movie, if I may use this term, of a process in which the formal meaning of the economic took place, with its associated moral imperative of organising and economising, conflicting to a large extent with social order (anticipating what at a general level will then result as the historical reduction of social life to business- and firm-like mechanisms: cf. Polanyi, 1977). Though the term efficiency never appears in the documents, its ethos and pathos are there (in particular, see below, the vision by Drachio and his reform proposal), fostered by accounting and discourse about managing. This suggests, at least in a preliminary way, that the terms in which we understand accounting and management, and the very 'genesis' of management need to be re-addressed or re-considered,

² 'The genealogist is not likely to be entranced by yet further examples of "cost management", "cost accounting" or even "managerial accounting" prior to the late nineteenth century' (Miller and Napier, 1993: 639).

³ Though epistemologically cautious in the first part, the second part of the following sentence reveals how such a view is sometimes shared even by non-traditional accounting historians: '...there is something counterproductive in searching for the first "event" where financial accounting can be found adapted for cost calculation' (Ezzamel et al., 1990: 157, emphasis added).

if we are to comprehend how and why these ideas could have been developed at this period.

Indeed, the Arsenal episode seems to question the taken-for-granted sequence in time of accounting practices according to the common view in accounting historiography (e.g. Parker and Yamey, 1994): the 16th and 17th centuries saw the spread of double entry book-keeping; then the closing of the book for the mercantile business and later on other kind of businesses, while costing and other managerial uses of accounting are seen emerging only recently,³ in the 19th century (for a critique, see Zan, 1994). At the Arsenal, what seems to have happened is that costing and calculative practices (including the not-so-easy determination of the cost per galley) spread quite quickly, just a century after Paciolo's publication. Indeed, as the call for a genealogy of calculation has argued (Miller and Napier, 1993), one might wonder whether the clear-cut distinction between book-keeping and managerial uses of accounting information has any historical foundation; or is it the result of a reductionist view of the complex sense-making process involved by accounting, even in earlier periods.

A further issue refers to the 'why' in the emergence of modern forms of management and accounting discourse. Once again, Chandler's explanation seems to be the dominating paradigm, both in business history *and* accounting. The invention of management is to be seen as the response to micro economic efficiency arguments linked to the establishment of technologies with strong economies of scale, of course in the 19th century (Chandler, 1977; Pollard, 1965; Johnson and Kaplan, 1987. For a critique, see Hoskin and Macve, 1986, 1988; Miller and Napier, 1993; Ezzamel, 1994; Ezzamel et al., 1990; Loft, 1995; Funnell, 1996). Clearly, this explanation has some degrees of validity; however within a falsifying approach the anomaly of Venice Arsenal can help us underlying the partial value of Chandler's (and derived) theory. For economies of scale have little to do with changes occurring at the Arsenal, and few other economic concepts could be used to explain what was taking place in managerial terms, apart from the notion of 'complexity'. More in general, indeed, what this piece of research seems to suggest is the call for a contextual kind of research (*à la* March, 1988) for understanding organisational innovation, also within management, accounting and business history research. Management, from this perspective, should be seen as a disciplinary phenomenon (Hoskin and Macve, 1986). Where such disciplinary practices tend to be put to work, a discourse of management will circulate, with the associated role played by calculation and their discursive nature, calling for attention to '... the ways in which calculative practices are endowed with meaning, how they are

constituted as practices of a definite sort through language, vocabulary, ideals and rationales that set out the objects and objectives of calculating' (Miller and Napier, 1993: 645). At one level, as protagonists begin to undertake such practices, they will generate forms of knowledge, data, information; they will examine that information; they will evaluate and quantify possible plans and outcomes on the basis of such examination. But also there will be wider discursive effects. Forms of resistance and evasion will be articulated; and additionally, forms of reflective analysis, wherein different levels of co-ordination problems are diagnosed, and solutions proposed. Indeed, all this kind of managerial activity is visible in this Venetian episode. Managerial practices are put to use. A managerial discourse begins to circulate. Both are also resisted.

The paper is organised as follows. Drawing on secondary sources, Section 2 briefly puts this episode into its context, also revisiting some of the interpretational questions raised within the longer literature of Venice and its Arsenal. Section 3 provides a brief discussion of the nature and availability of primary sources, and the consequences for the present research strategy in terms of discursive approach. Section 4 presents a detailed illustration of primary archival material, focussing on both discursive continuities and changes on managing and accounting issues. Section 5 then tries to interpreting the nature of these change processes, and possible meanings in the evolution of management and accounting discourse at the Arsenal in such ancient context. In the concluding remarks, some of the limitations of this article are outlined, also stressing the distinctive contribution of this research compared to the debate.

2. Drawing on secondary sources: the Arsenal background and context

The literature on the history of Venice provides sources with invaluable information on the growth and functioning of the Arsenal, and on such features as the range of boats built, the process of construction, and the complexity of its social, political, architectural, and organisational arrangements.⁴ On the other hand, however, most of these works come from the more generalist field of history or social history, or from other specialisation (e.g., history of architecture, given the importance of the whole site for the very morphology of the city, still today covering about the 10% of the metropolitan area), so that the particular complexities posed by references to practices of the accountant (*rasonato*) and discourses of management (*maneggio*) can be too easily overlooked or elided. In other words, as non-experts in accounting issues, general historians risk not to fully understand the relevance of documents, notions and discourse in

their technical implications.

The broader political and economic context in which the Arsenal episode takes place is one in which the Venice maritime Republic acts as one of the dominating states around the 15th and 16th century, certainly in the Mediterranean area. As Lane underlines, this was in large part due to its strategic advantage in sea power – both in the size of its military and merchant fleets and the quality of the ships in them (Lane, 1934: 25–6). In the case of the military fleet, Venetian shipbuilders established a reputation which was to last from about 1300 to almost 1600, for producing some of the best designed and built fighting ships available: of these, the largest proportion were the galleys, in particular the light galleys (*galea sottile*), which were then supplemented by a smaller number of great galleys (*galea grossa*). Within this context, the role of the Arsenal was clearly crucial, and possibly increasing in parallel to the development of the Turkish threat in the 16th century. Founded around 1100, it was up until 1300 relatively small, and indeed may not have consisted of more than a storehouse for supplies (Davis, 1991: 48). By 1300, however, with the construction of the 'New Arsenal', shipbuilding had begun on site (as opposed to being undertaken exclusively in private yards), with a mix of private merchant vessels and ships for the state. From 1302, the provision of a monopoly was established, forbidding the building of ships for the state elsewhere (Rossi, 1991: 727–728).

For space reasons I will simply outline some of the major points already discussed in the Venice literature concerning the Arsenal. First of all, the specialisation in military ships after 1535 and later its monopoly have relevant implications. For, while private business appears to have faced a serious de-

cline in production of large ships, as new types of large, square-rigged merchant ships were developed in North European countries during the 16th century, and picked up some of their trade (not least by opening up a route to the East round the Cape of Good Hope) – by 1606 at least half the merchant fleet in Venice was of foreign manufacture (Lane, 1933: 230 ff.) – production in the Arsenal was not affected in the same way, because of a sustained demand for military galleys from the Republic.

Second, this also meant that the Arsenal would be affected by military strategy decisions of the Republic, such as the decision to keep a reserve of ships 'in readiness to be caulked, launched, rigged and armed' (Lane, 1934: 141–2). This was done to an extent not found in any of the other fleets in the western world, with 100 light galleys available plus 12 great galleys (compared for instance to the 14 galleys of Genoa Republic as the same time: Concina, 1987; Doria and Massa, 1988). The decision was reinforced after the Lepanto events, where the Turkish fleet was destroyed or captured, but had a new fleet up and ready just 18 months later (Casoni, 1847; Lane, 1973; Concina, 1984; Rossi, 1991). As Lane (1934: 142) clearly puts it, 'the maintenance of this hundred galley reserve became the chief goal of the Arsenal's activity, and remained so until the standard was lowered'. In order to give an idea of the magnitude of the phenomenon, one should keep in mind that according to Lane (1934: 242) the Venetian fleet in the sea during the period 1544–1602 was composed of 117 to 135 light galleys and six to 18 great galleys: the Arsenal was thus 'parking' almost an entire additional fleet in its space.

Third, it is the specific ways in which such a policy was put into action that have a particular implication here, in terms of the mechanisms of acquisition of ships and ships' reserve: i.e. the inner production within a branch of the state administration – the Arsenal – as opposed to purchasing ships from the private shipyards in the case of Genoa, or even the self-production of warships within the military organisation in the case of Istanbul (cf. Concina, 1987; Doria and Massa, 1988). What is to be underlined is the process of internalisation – using Williamson's terminology – of production activities, basically completed in the turn of the 15th century, wherein transformation processes took place under the control of representatives of the Arsenal. What, in retrospect, emerged was a system of constant continuing construction, something that did not happen in private shipyards, where the construction of bigger merchant ships 'was usually an isolated industrial episode, incidental to the general commercial activity of those who initiated and financed it' (Lane, 1934: 124), and as such usually a temporary joint venture between a particular group of merchants.

⁴ Only a very squeezed reference to the Venice literature is possible here. Indeed, there is an extraordinarily interesting and abundant source of specialist literature on the history of Venice, as well as a wealth of material on the Arsenal and its shipbuilding activity, one of the major industries of the time. Given its inner richness, any attempt to summarise the social and institutional fabric of the *Serenissima* would appear naive (as for instance regarding the relationship between the Senate and its working bodies): one simply has to address the reader to the literature, to some extent also available in English or French (indeed Lane himself can be considered the most important historian of Venice):

- On Venice History: Besta 1903, 1912; Braudel, 1958; Braudel et al., 1961; Brown, 1895; Cessi 1931; Ciriaco 1996; Doria and Massa, 1988; Lane, 1933, 1973; Luzzato, Bognetti, 1961; Pullan, 1968; Pullan and Pullan, 1992; Rapp, 1976; Romanin, 1974; Rossi, 1991, 1997; Tenenti, 1961; Bellavitis and Romanelli, 1985; Zambon, 1997, 1998; Zannini, 1994.
- More particularly on Venice shipbuilding and the Arsenal: Caniato, 1996; Casoni, 1847; Concina, 1987, 1984; Conterio and Da Villa, 1996; Davis, 1991; Forsellini, 1930; Gennaro and Testi, 1985; Lane, 1934, 1969; Romano, 1968; Rossi, 1996; Salvadori, 1987.

Such a character of permanent production and its associate complexity represents a distinctive element of this entity, also in comparison with other maritime republics of the time (Concina, 1987), which seems to anticipate size and complexity that will become common just after the industrial take-off. A vast number of people concentrated into one site – about 2–3,000 workers – made it one of the biggest concentrations of workers in the world at that time (Davis, 1991: ch. 1; Lane, 1969).

Fourth, some aspects already discussed by the general historiography about Venice and the Arsenal in terms of organisation of labour need to be recalled, though somehow contradictory in nature. As Rossi (1996) puts it, starting from about 1360, a process of hierarchical separation within the workforce seems to emerge, giving rise to a professional elite of permanent employees. This élite of *salariati* – the admiral, the four major *proti*, the storekeeper, and the accountant – were treated differently from ordinary workers, who were paid on a weekly base according to their presence at work (at least in principle); they instead were paid a yearly salary, and were viewed as occupying permanent positions. Obviously, the meaning of this hierarchical structure should nonetheless be interpreted with care, for the relations between different levels of employees and officials are far from clear or linear. The creation of a number of other posts – doorkeepers (*portonieri*), timekeepers (*appontadori*), inspectors (*stimatori*), plus at a much higher level, an ‘overseer of the masters’ (*revisor delle maestranze*) – in addition to a process of specialisation of officer positions (*patrano* and *provveditore*) is in itself a signal of an increasing effort in organising the Arsenal starting from the second half of the 16th century (Forsellini, 1930; Lane, 1934; Romano 1968; Davis, 1991). But still the structure and organisation of work remained in many respects hybrid. Considering day-to-day production processes, it appears that there was good reason why problems of co-ordination should have remained, since, on the ground, the master craftsmen seem to have retained considerable scope to assemble their own teams through various informal arrangements, and to work fairly self-regulated hours. In the most highly-skilled areas at least, the tradition of expert control over the shape and pace of work remained as strong as it did in private yards. To all intents and purposes, shipbuilding remained a craft tradition, with mastery of the craft being very much a closed shop, often kept within families, or else passed on via long apprenticeships. So, while state-inspired regulations, such as that controlling the number of apprentices and their allocation to a master, could impose some overall constraints, at many levels, there remained considerable scope for avoiding hierarchical pressure (Lane, 1934;

Davis, 1991; Rossi, 1996).

But overall, whether workers actually reported for work at the Arsenal seemed to be largely out of control. Workers were enrolled in the Arsenal according to the social norms of the guilds; however, actually going to work was largely discretionary, and to a large extent residual to what private yards could offer in various periods or days (Caniato, 1996). Should the workers decide not to report for work at the Arsenal on a particular day, the production process would suffer as a consequence; should they decide to go to the Arsenal, they would be paid even in the absence of work. In this sense, the difference between enrolled and active workers seems to have been one of the major problems in the development of the Arsenal (cf. Davis, 1991, who also provides in his Table 1.1 some Figures for the period 1503–1696: for instance, in the year 1559, 600 carpenters were employed out of a total of 1,024 enrolled, 300 out of 1,013 caulkers, and 60 out of 146 oarmakers).

It is precisely within this context of a ‘hybrid organisation’ – i.e., modern and pre-modern at the same time, whereby working relations are already internalised according to a capitalistic mode of production, though labour itself is not totally under control, with the persistence of pre modern forms of labour organisation – that in the second half of the 16th century a series of initiatives were introduced in an attempt to map out more consistently the overall organisational scheme. Here some major interpretational disagreements with Venice historians can be pointed out.

For instance, while Lane applauds developments where they look relatively modern, he does not offer any overall appraisal of the balance of old and new, power and resistance. So, in his chapter on work-discipline (Chapter 11), he gives copious examples of the rigorous discipline theoretically imposed to control attendance and activity via bells, attendance lists, and sanctions for non-attendance, and checks on pilfering and waste of materials; yet he simultaneously notes the dangers in holding official position, with paymasters being threatened and assaulted (1934: 189–192). Elsewhere, he seems to see practices of direct disciplinary control as being likely to have managerial effects, if only the power of the masters could have been broken. So he notes an intensification in the organisation of work in 1569, when the system whereby construction bosses were put in charge of master carpenters was reorganised, to allocate the latter to the former on an alphabetic basis. Clearly, he sees this as a major step forward: ‘At last the management proposed to require the masters to render an accounting for the time they spent in the Arsenal’ (1934: 209). But he then has to note that the crisis of the war of Cyprus (1571) meant that the system was abandoned and two decades later

the masters were back to setting their own estimates of the work feasible each week, and excusing failure by blaming their workers. The extent to which the system was effective is thus questionable.

If this is, then, an approach that tends to shed light on the level or existence of managerial control mostly by chance, or in passing, a rather different impression is derived from Davis. Davis has a more articulated approach to the possibility that here there was management. But arguably he then overplays the case as, in going back over Lane's data and extending it, he sees the Arsenal as, in many respects, having succeeded over this period in breaking with the culture of contracting and market-like transactions. For him, the co-ordinative changes introduced from around 1560 on enabled 'a much more efficient use of technical skills and available labour' (Davis, 1991, p. 55). According to him, the power ceded to foremen and bosses, to allocate workers to particular contracts, and impose wage reductions for poor performance, was significant and effective. The doubt is, in this case, that Davis has simply applied the term management too freely to describe all forms of workplace change. It is possible that by around 1500 there was already 'a strong tendency toward specialisation by managers themselves, and offices began to multiply in number while taking on more precisely defined responsibilities' (1991: 50). But a proliferation of posts is not necessarily a sign of effective co-ordination; and elsewhere Davis himself argues that the culture of contracting and the dominance of master craftsmen was still unchallenged to a large extent (pp. 28–36).

Then again, the position taken by Concina, which is virtually opposite to that of Davis, as he argues that 'administrative capabilities seem to be lacking' (Concina, 1984: 175), seems to go too far in another direction, missing the organisational innovation that was taking place in that context of a permanent organisation, given the evidence that there was already a notion of an at-least hybrid structure, by the 1570s, and so well before the development of 'the visible hand' of modern managerial capitalism in the US.

In short, from this quick review of the literature for the period after 1545, the situation is not one that can be described as managerial at this point. However, there are clear signs to suggest that the imposition of targets had certain discernible effects on discourse and practice as a result of the processes of institutionalisation and organisation taking place from the early 16th century on (see also, Forsellini, 1930; Romano, 1954; Lane, 1973; Davis, 1991; Rossi, 1996): some were effects of resistance, but others indicate a commitment to initiatives for change.

It is in this context that a further commitment to order, method and system both within the Arsenal

and in its administrative oversight emerged, with a new role played by accounting innovations, and with four strikingly modern-seeming reports that Lane refers to (written in 1586 and 1596 by Baldissera Drachio; and in 1593 and 1594 by Bartolomeo Tadini – not as Lane has it, Taduri). One could argue that, for Lane, they appear to come almost as if out of the blue, almost as a kind of Enlightenment thought, particularly the proposals of Tadini, the chief accountant of the Arsenal, which he describes as being set forth in 'a more precise and exacting spirit, and with more complete disregard for traditional craft distinctions' (1934: 214–215). Yet my view is that these reports, though exceptional in their clarity of detail and reflection, form an integral part of an emergent discourse in the 1580s, which was focusing on co-ordinative issues in a new way. Thus, one of the issues for consideration in analysing the debates over control, cost and accountability which are encountered in primary sources (including a critical reading of the four reports quoted by Lane), concerns the degree in which the contest or hidden agenda is over the construction and definition of boundaries of ownership – whether over time, materials or, in particular, over expertise and control in design and construction – as the means to establishing a power and right to co-ordinate and 'manage' activities.

In that sense, one of the most important differences between the present article and the Venice literature is perspectival, for the unproblematic use of accounting data and reports about managing activities by Lane (and to a similar extent by other historians as well) implicitly assume a positivist vein, ignoring the nature of social construction of discourses and measures that were taking place and meaning at that time. Understanding these aspects (i.e., the procedural rationality of accounting notions and managing documents more than its substantial rationality, the 'why' and the 'how' they emerge, more than the 'what') is what is here searched for.

3. Research strategy and primary sources: inferring accounting and management practices. The reports 1580–1643

The option for a broad view of accounting and managerial processes underlying this article is not merely linked with the epistemologies preferences of the author toward more holistic kind of approaches (similar to Parker, 1999). It is first of all linked to existing primary sources about the Arsenal in the archives.

There is no doubt that the Republic was intensively using accounting in almost every aspect of the public administration, and that the Arsenal itself was involved in such a process (on the use of

double entry in this regard, see the seminal work by Besta, 1903). But despite the 65 kilometres of shelves in the Venetian State Archive (ASV), no systematic accounting records and books at all have survived, either in general with reference to the Republic or in particular with reference to the Arsenal. A deeper understanding of these aspects calls for further investigation in the archives (Zambon and Zan, 1998; Rossi, 1998; Zambon, 1997, 1998. According to Michela Dal Borgo – in progress research – accounting books and records were deliberately destroyed between 1813 and 1815).

On the other hand, starting from available primary sources there are other kinds of documents, which can be analysed trying to get insights on accounting and management practices of the time. The research context is one where comments and text on accounting can be found in several documents, though without accounting books an other systematic form of accounting representation, and without understanding fully the design of the pervasive accounting system that was likely to be at

work. Thus one has to infer discourses about managing and accounting working on texts and talks.

There are basically two sets of such sources. First, the archives produce a huge amount of laws and deliberations, carried on by different authorities of the Republic, which were all known as Senates, according to the complex legal and institutional structure of the *Serenissima*.⁵ Deliberations concerning the Arsenal could include general or technical matters, ranging across production policy, reserve of galleys in readiness, rules for hiring and regulating manpower and so on (from a screening of the archives the relevant documents are listed in Table 1a).

Second, in trying to better understand the kind of

⁵ Those referring to maritime issues are mostly kept in the archive of the *Senato Mar* (maritime Senate), but there were other bodies, with overlapping memberships, any of which might become involved in a particular issue (for an overview cf. Lane, 1973; Concina, 1984; Davis, 1991). On the structures and functioning of different institutional and political bodies – *magistrature* – see Rossi, 1991.

Table 1
Primary sources on the Venice Arsenal (§)

<i>a) Major relevant laws and deliberation in the period</i>	
1545, 3 July	S.M., reg. 28, c. 178v
1545, 18 September	M.M., reg. 240, c. 2r
1569, 31 March	P.P.A., reg. 11, c. 56r
1577, 15 March	S.M., reg. 43, c. 65r
1577, 13 September	S.M., reg. 43, c. 117r
1580, 20 February	S.M., reg. 44, c. 152v
1580, 12 May	S.M., reg. 44, c. 170v
1581, 21 March	S.S., reg. 83, c. 5v
1581, 10 June	S.M., reg. 45, c. 20r
1581, 24 August	S.M., reg. 45, c. 39v
1582, 09 February	S.M., reg. 45, c. 96r
1582, 23 March	S.M., reg. 45, c. 103r
1582, 14 August	S.M., reg. 45, c. 136r
1583, 1 July	S.M., reg. 46, c. 35r
1583, 21 July	S.M., reg. 46, c. 40v
1584, 18 December	S.M., reg. 46, c. 224v
1585, 15 February	S.M., reg. 46, c. 242v
1586, 29 August	S.M., reg. 47, c. 205v
1587, 24 February,	S.M., reg. 47, c. 259v
1588, 11 February	S.M., reg. 48, c. 143v
1588, 7 June	S.M., reg. 49, c. 44v
1588, 13 September	S.M., reg. 49, c. 92v
1588, 15 October	S.M., reg. 49, c. 108v
1589, 22 May	S.M., reg. 50, c. 31v
1591, 2 February	S.M., reg. 51, c. 118v
1591, 25 May	S.M., reg. 52, c. 42v
1591, 30 November	S.M., reg. 52, c. 129r
1594, 10 May	S.M., reg. 55, c. 26v

Note:

§ A.S.V.: Archivio di Stato di Venezia; P.P.A.: Patroni e Provveditori all'Arsenal; Ö.N.B.W.: Österreich National Bibliotek Wien

Table 1
Primary sources on the Venice Arsenal (§) (continued)

b) Institutional and ad-hoc reports on the Arsenal activity:

Year	Author	Role (*)	Archive position (§)
1580	Relazione	Andrea Querini	Patron
1581	Scrittura	Zuanne Falier	Provveditore
1586	Ricordi	Baldissera Drachio	(Unknown position)
1591	Relazione	Giovanni Priuli	Savio
1593	Scrittura	Bortolamio Tadini	Rasonato (accountant)
1594	Scrittura	Bortolamio Tadini	Rasonato (accountant)
1596	Pensieri	Baldissera Drachio	(Unknown position)
1602	Relazione	Giovanni Battista Contarini	Provveditore 100 galere
1624	Relazione	Mateo Zorzi	Savio
1626	Relazioni	Francesco Molin, Girolamo Zane, Nicoldò Contarini, Vincenzo Gussoni, Marino Zorzi	Respectively: Consigliere, Capo di Quaranti; 3 savi (del Consiglio, di terraferma, agli ordini
1628	Relazione	Andrea Morosini	Savio
1633	Relazione	Alvise Molin	Savio
1636	Relazione	Domenico Lion	Savio
1639	Relazione	Priamo da Lezze	Savio
1641	Relazione	Giovanni Priuli, Matteo Zorzi	Savi (missing report)
1643	Relazione	Paolo Contarin	Savio

Notes:

* Patron, Provveditore, Savio, Consigliere and Capo di Quarantia are all institutional positions, by election.

§ A.S.V.: Archivio di Stato di Venezia; P.P.A.: Patroni e Provveditori all'Arsenal; Ö.N.B.W.: Österreich National Bibliotek Wien.

'reform' at the end of the 16th century that Lane was referring to, what emerges is the survival of a further type of source materials, in the form of reports on the Arsenal activity, written between 1580 and 1643, the emerging of Candia crisis, whose fall in 1679 will eventually mark the decay of Venice sovereignty over eastern sea (see Table 1b). These are periodically produced, official documents, i.e. reports that different institutional Figures, elected by the Senate as officials responsible for the affairs of the Arsenal (e.g. *savi*, *patroni*, *provveditore alle 100 galere*), were required to submit at the end of their term of office, according to the regulations of the Republic. In addition to the reports already mentioned by Lane – and

written by Drachio and Tadini, which can be defined as specific and independent initiatives, written by men who knew the Arsenal intimately, but were not writing in an official or state-inspired capacity – these documents constitute a whole set of data, framing to a great extent the particular time-horizon of this article.

That the reports from 1580 onwards are an integral part of the same process of change in running the Arsenal is demonstrated by a ruling by the Senate on 20 February 1580, that we found in the Archives (ASV, Senato Mar, reg. 44, cc. 153v–155v). According to this deliberation, elective representatives – *savi*, *patroni*, *provveditori* – were asked to report systematically to the Senate

on several major issues of concern to the running of the Arsenal (e.g., the situation of the workforce; the stock of oars and other parts of the ships etc.).

A screening of the archives reveals that no such reports exist prior to 1580, while they persist in the following period (11 reports in the 17th century, plus three in the following one, up to 1781). It is worth noticing that the 1580 ruling to provide regular reports is set within a world where already there were discursive concerns with targets and demands, posed by what is referred to as 'the 100 galleys issue'⁶: an 'old' issue that was dramatically enforced few years before – in 1577, just following the Lepanto event and the perception of growing pressure from the Turks that this 'useless' victory implied – and that in turn was given new visibility by the 1580 ruling. It explicitly addresses the issue, underlining the problematic achievement of the 100 galleys target and possible causes (e.g. the lack of standardisation in timbers' design, and the lack of manpower).

All of these documents are lengthy narratives, extensively examining aspects and problems in the running of the Arsenal in a less fragmented and specific way than is typical in the comments made in the individual legal decisions and deliberations (just to give an idea, most of these reports' run to about 20–30 pages). The particular value of these reports is the way in which they reveal what was said (and what became sayable) about running the Arsenal. By examining how such issues were addressed one may distinguish what was on the agendas of the various actors. If, as March (1988) contends, the problem of organising and managing is mainly a problem of addressing attention, then by looking at the issues at the core of these documents, one has a first means of reconstructing the main characteristics and the temporal evolution of management and accounting discourse at the Arsenal (curiously enough, Drachio himself on 1586 were referring to *il discorso del maneggio*). For what they show is the kind of meta-level of discourse, in which informed individuals are engaged not merely in managing the Arsenal, but in 'talking' about what they were doing, in circumstances where they wished to, or had to, 'account for' managing concerns, objectives or targets. In order to write their reports, they were forced to construct and invent notions and concepts which could help them in representing this reality.

The length of these documents and the number of deliberations taken into account (as listed in Table 1) raise a serious methodological question as to how to present such primary sources to the reader. First there is a linguistic problem. These documents are in old Venetian: quoting direct text extensively would not be helpful for the international community, while translation in modern English would increase the risk of anachronism

and associations with current day meanings. Second, direct text analysis would require an enormous amount of pages, and it is not the only alternative, especially when trying to reach some understanding of the whole set of documents as in this case.⁷ Thus a different – and perhaps more risky – approach is opted for here, i.e. to give an account of my own understanding of the documents without directly translating the texts, except in a few cases, leaving for the future the project to publish the full set of documents.

4. The construction of organisational agendas at the Arsenal (1580–1643)

In describing the content of primary sources, I am mainly interested in both discursive regularities and changes. First, the focus will be on regularities: what, for instance, are common aspects in the reports, both in terms of what is a matter of concern and how issues are structured and dealt with? In analysing discursive changes, the second sub-section revisits the contributions already discussed by Lane by Drachio and Tadini. Then, the third sub-section will investigate discursive changes as evidenced in the reports of the Senate appointees in the period following the Drachio and Tadini reports.

4.1. Discursive regularities

In terms of contents, three issues are constantly raised in all the reports under investigation: the ships inventory, the level and state of materials available, and the provision of an adequate labour force (a synopsis is provided in Table 2). A further residual category can be subsumed under the label of broader organisational issues, though such a modern form of speech is never used as such in the reports.⁸

⁶ The following steps can be reconstructed in the process of setting the 'hundred galleys' goal, drawing on further material from the archives: initially (1442) the number was set at up to 50 galleys, then reduced to 25 in 1531, then enlarged up to 50 in 1533 (see Lane). On 5 August, 1545, it became 100 (*Milizia da Mar*, reg. 240, c. 2r); on 3 July, 1546, the number of 100 light galleys plus four great galleys – plus other minor ships – was made explicit (*Senato Mar*, reg. 28, c. 178v); from 1577, 13 September, what would be the stable composition of 100 light + 12 great galleys was set (*S.M.*, reg. 43, c. 117r).

⁷ Interesting enough, a similar methodological dilemma – and a similar solution – was affecting Besta in his seminal research on the accounting rules of the Venice Republic in the 18th century, still one of the most important studies on this issue (Besta, 1903) from a public sector and state-accounting perspective.

⁸ One could argue that it is rather puzzling that I refer to discursive regularities in the case of 'broader organisational issue', when such a category is missing in the documents. I see the point in terms of level of abstraction: they were able to talk of individual, elementary issues of what in current terminology is referred to as 'organisational issues', without identifying such headings; i.e. the far-from-concrete meanings and their commonalities and generalising value.

Table 2
Discursive regularities in the documents and reports on the Arsenal, 1581–1643

<i>Major issues (or 'Chapters')</i>	<i>Procedural aspects and problems at the substantive level</i>	<i>Insights on major managing</i>
Ships Inventory	<ul style="list-style-type: none"> • Stock measurement • Completion measured in terms of production stage 	<ul style="list-style-type: none"> • High degree of product heterogeneity; high number of ships; • Troubles in achieving the 100 galleys goal
Materials	<ul style="list-style-type: none"> • Physical inventory by class of components • Often presenting needs and purchasing orders 	<ul style="list-style-type: none"> • Serious difficulties in procuring materials, oak in particular; • Diffuse wastes for dis-organisation; thefts and misappropriations for lack of discipline
Work force	<ul style="list-style-type: none"> • Quantitative description on manpower (in units) • Comments on the quality of the workforce (workers and intermediate levels) 	<ul style="list-style-type: none"> • Short term lack of work force; • Decreasing quality for recruitment policies of apprentice and for carrier and pay structure compared to the private sector
Organisational	<ul style="list-style-type: none"> • Reference to contracting in/out and boundaries definition aspects • Focus on issues of labour discipline • Notes on problems in production programming 	<ul style="list-style-type: none"> • Disciplining labour as historical priority; • Regulation of presence during wintertime; • Different opinions on contracting out

4.1.1. Ships' inventory

The measurement of the current inventory of ships in readiness is perhaps the major concern of all the official reports, as one would expect given the strategic prominence accorded to the '100 galley target'. The early reports (1580, 1581) were concerned with measuring stock completed rather than the rate of flow through the construction process, or rates of completion. This is not just because the notion of period was as yet adjustable, rather than fixed in calendar-based units (as in general for the financial statements of private partnerships of the time). It also relates to the fact that the only measures of construction progress utilised in many of the reports (1580, 1581, 1591, 1624, 1639) were simple measures of degree of completion at the given moment of reporting. Such measures paid attention purely to the current point of

progress achieved, simply describing the different stages of production in their physical features.

In addition to those procedural aspects, some major problems at a substantive level also emerge, as discursive regularities:

- the number of ships to be managed: up to 200 might be in dock and 'awaiting work', even if not all were necessarily under active construction. For instance, in the 1580 report, 189 ships of different kinds were counted, at various stages of completion;
- the variety and range of production and support tasks to be undertaken: there are not just references to different types of ship (e.g. light and great galleys, *fuste* and *brigantini* and others), but also to work on new construction and refurbishment, all at various stages of production (e.g. 1581, 1591);
- the problem of deterioration: ships for refurbishment might already be rotted beyond repair, new ships and materials might be left unfinished too long, with an associated waste of the scarce resources of wood and labour (cf. for example 1591, 1624);
- the problem of the 100 galleys target: from time to time discussions for and against contracting out to increase production (so-called *sopra di sè*) can be found in order to achieve the target (1581, 1591, 1633, 1639).⁹

4.1.2. Materials and components

This is an issue that is discussed in all reports,

⁹ A similar sort of controversy can be found in the deliberations – whether rejected or approved – concerning contracting out issue in the same period (see Table 1.a for Archive location details):

1581, 21.03 proposal to contracting out 30 galleys (rejected)
 1581, 10.06 proposal to contracting out 30 galleys (interlocutory decision)
 1581, 24.08 proposal to contracting out the refurbishment of 20 galleys (accepted)
 1582, 23.03 proposal to contracting out the refurbishment of further 20+2 galleys (accepted)
 1585, 15.02 removal of constraints to contract out (rejected)
 diagnosis of failures in last contracting out experiment (accepted)
 1586, 29.08 removal of constraints to contract out (rejected)

except that of 1581. In the official reports, this is usually looked at through the lens of the 100-galley target, i.e. as an analysis of the physical amount available, or needing to be purchased, in order to fulfil outstanding production needs. Here, reporting on materials inventories was often coupled, discursively, with 'good practice' comments, concerning the best ways of conserving different goods, from a production management perspective, i.e. focused on the probable useful lifetime of materials.

Once again, the reports also give important insights on substantive issues as perceived and framed in the discourse about the Arsenal. One major difficulty constantly raised concerned the provision and quality of key materials, especially wood, which was the more critical factor in construction (e.g. 1580), an aspect that had always been a concern, calling for a policy to conserve and replant oaks already before 1500 (cf. Lane, 1934: ch. 12). Here both the initial supply and the subsequent storage of the wood became significant issues, with waste avoidance a major theme. In this regard, a new concern enters the discourse, a concern with waste or loss, in the sense of misappropriation, now applied to goods in general, or to the misdirection of official oversight (1591, 1633). The term *rubberie* had long been applied within the Arsenal to thefts of manufactured items, such as iron components (*ferramenta*), munitions and spare parts. But now it began to be applied to wood, whether worked or not, as part of the more general attempts to impose a more systematic and comprehensive discipline on the actions of the labour force.¹⁰

4.1.3. The provision of labour

Again with one exception (1586), the reports always make reference to provision of labour issues. The official ones tend to have a quantitative dimension, presenting a recurring form of calculation of numbers man-working (1581, 1591, 1602 etc). However, the picture is rather confused, given the varied and changing patterns of employment within the Arsenal. This is particularly the case for those skilled areas where there were both enrolled (*iscritti*) and active (*attivi*) workers, and where references do not make it clear which category is being counted, and where considerable fluctuations seem to take place (e.g. for periods when short-term emergencies might require all available workers to sign in, or alternatively when a desire to cut costs led to job-sharing and underemployment policies).¹¹ In addition, criteria of classification are not necessarily stable across reports (e.g. concerning who was defined as apprentices).

Indeed, report-writers may well have confronted a double difficulty here, first in terms of handling the discursive category of labour in a consistent

way, and second in terms of the capacity for controlling and governing the hiring and deployment of labour. Perhaps in part as a result of such recording difficulties, labour is treated in a rather contradictory way. When the object of attention is the mass of workers, rather general and unfocussed comments tend to be made, e.g. on the nature of the work done by a given group, and the alleged declining quality of the workers (e.g. 1581, 1591). On the other hand, when the discussion concerns higher-level personnel (*capi* and above), more detailed and concrete observations are made, e.g. on enforcing discipline or building motivation. In any case, they often invoke a theme of declining skills (1591), which they link to an inadequately planned process for recruiting and training apprentices, low wage levels in comparison to those in the private sector, and poor promotion prospects, even for good workers, given the power of seniority.

4.1.4. Broader organisational issues

A number of comments on broader issues take place in the official reports. For instance, proposals for changing organisational structure and superior/subordinate relationships are on occasion raised (1591). This again mentions the contracting-out option, and presses the urgent need for restructuring both labour control and the construction process. The level of abstraction may perhaps indicate some implicit attempt to articulate what could today be described as an internalisation/externalisation trade-off. Alternatively, it may simply reflect, in the briefness of the comments, how un-

¹⁰ I would like to thank Carlo Poni for the observation on the changing scope of *rubberie* (Poni, 1997). Insofar as the move towards imposing discipline went beyond making workers respect existing rules and norms of what constituted 'theft', and constructed new norms according to which misappropriations of other materials became constructed as illegal behaviour, what was arguably at stake was the redefinition of the boundaries of ownership and proper behaviour within the Arsenal. More generally, we know of course that in many pre-modern production facilities (cf. Thompson, 1967; Hopwood, 1987), boundaries might be blurred over who 'owned' time, or expertise, or such relevant support factors as tools and peripheral materials. Often there was some acceptance of the practice of 'liberating' or redirecting materials to private purposes.

¹¹ On the peculiar logic of labour relationships and their evolution cf. Lane, 1973; Davis, 1991 (cf. also in particular the difficulties for checking and comparing sources on labour, Table 1.1 p.13). Taking the debate further, Rossi (1996) and Caniato (1996) suggest, against Davis's interpretation, that there may have been a long-term excess in the supply of labour which, from around 1500, led to skilled groups setting up their own rota systems. Caniato then suggests that the occasional demands for extra labour should be understood as short-term counter-cyclical movements. Some of the Senate deliberations suggest yet another possibility for our period at least, i.e. that the situation, after the war of the 1570s, may have been different for different guilds. So it appears that there may have been a shortage of *marangoni* and *remeri*, but an oversupply of *calafati* (see 1582, 14.08; 1583, 21.08; 1588, 15.10; 1589, 22.05).

likely change was seen as being, so long as the guilds were able to retain such self-regulation over their work practices (cf. 1581, 1591, 1639). When discussion turns to such issues as disciplining labour over absences, or such misdemeanours as violence, drunkenness, misappropriation of materials or prostitution within the workplace, the comments are much more focused (1624). Here one finds a traditional focus on punishment of the individual for the act, via sanctions, rather than a more diffuse or strategic disciplinary concern with enforcing new boundaries and governance structures, by redefining who owned expertise and 'directive intelligence'.

While such elements are interesting as a sign of (partial) structuration at the procedural level, in substantive terms they suggest that labour relations seem to have been, especially in the first period, a major unsolved problem; similarly, major difficulties were visible in the organisation of production processes.

4.2. Discursive changes: the contributions of the 'insiders'

Within such a relatively established tradition or flow of reports on the Arsenal, major innovations are then provided by the two experts (as opposed to elective officer), with general yet detailed overviews of the whole set of processes, offering as well integrated sets of proposals.

4.2.1. Baldissera Drachio (1586, 1596), memories of an expert

Shrouded in mystery by a lack of data, the role of Drachio is hard to be reconstruct, even though he designates himself as an Admiral. It seems easier in fact to define what he was not: the fact that his name is missing from any list of state appointees suggests that he was not a political representative of the Senate.¹² In addition, corroborating this assumption, it can be noticed that the structure and content of his ad hoc reports do not follow the genre of the institutional reports; for instance, he is not reporting on the actual figures of ships within the 100 galleys reserve, though he is particularly concerned about the issues as such, in merely procedural terms (differently from the officials' reports an actual estimate of the ship inventory is here missing). A minor enigma surrounding this person is the difficulty in understanding why he wrote two reports relevant to our study, on 1586 and on 1596, and the precise circumstances in which he wrote them. At the same time, they are both extensive in their scope, and detailed in their

recommendations.

The first report (*Ricordi intorno la casa dell'Arsenale*, Memories about the Arsenal house) represents an articulated proposal for restructuring the major managing rules and routines of the Arsenal, which manifests pluri-dimensional understanding of its organisational problems – unusually for the time, it is also graphically ordered with explicit headings for different aspects. Undertaking a modern re-writing of Drachio's proposals, I might summarise them as falling into three categories: a) organisation of production and logistics; b) organisation of labour; and c) overall organisational structure.

a) The organisation of production and logistics is investigated under three main aspects.

Procedures for better control of raw materials, particularly oak, are provided. The report starts with an analysis of the critical nature of the supply of oak (*Del modo di conservar li roveri*, On the method of conserving wood), given the virtual exhaustion of the forests in the area round Venice, and the growing needs of Arsenal activity. The problem, he suggests, can only be solved by optimising the use of all oak, at every stage of the logistical process, providing detailed rules for cutting, transportation, and above all storage of oak.

Standardisation of design characteristics in the manufacturing process is then called for. One feature of the tradition was that individual senior shipwrights chose their own timbers, and kept them in their own dock area, with their individual signature on all their components. Drachio calls for a change, recommending a new standard ship design, to be stored and issued centrally (*Della misura ordinaria delle galee*, On regulating the design of galleys). He argues that this will minimise mistakes and reworking, thus averting the consequent waste of oak, labour, and additional costs, while promoting the principle that the Arsenal 'should function as a body with just one head'. He proposes a common timber (*il sesto comune*) with standard dimensions, one which would be without name and fatherhood by any individual craftsman. He also proposes an impartial procedure for determining the dimensions of this timber (which if adopted would have been a further step towards undermining the power of the individual masters, by drawing senior members of the guild into the standardising process). His suggestion is that seven senior shipwrights should produce their individual ideal *sesto*, independently, and then a group of 'wise men' should choose the best one, judging blind. Rules and procedures for electing the group of wise men is then suggested (*Dell'elezione che si deve fare sopra le coperte delle galee*, On the necessary election re the galley design).

Re-specifications of the production layout are

¹² I am in debt regarding this statement to the research by Franco Rossi, an archivist at the Archivio di Stato in Venice, who has been attempting to gain insights on Drachio's role and personal history for some time, underlying the enigma of this figure.

then dealt with. Here Drachio, after indicating the current level of chaos and confusion, sets out how the separate areas for new construction and refurbishment should be planned (*Del modo di separare le galee nove dalle vecchie et accomodarle nei squeri con li legnami segati*, On the method for separating new and old galleys, and allocating cut timbers to each). He proposes that each new ship should be assigned its own requirement of standard timbers, thus promoting a more rigorous on site linkage between storage and production. This, he argues, should also end the problem of locating, identifying and retrieving previously 'signed' bespoke timbers from the large number of storage areas, scattered across the Arsenal. This, he argues, would dramatically reduce the waste of labour time, by eradicating long, frequent (and unnecessary) interruptions in the construction process. In addition, he suggests that a record of the period of construction should be maintained for each ship, thus enabling those begun first to be finished first. Such a sort of first-in-first-out logic would put an end to cases of ships rotting before being finished, with more associated waste.

b) The organisation of labour is treated with structural as well as procedural suggestions.

Following some preliminary observations on the importance of labour and motivating the workforce, Drachio proposes a new organisation of labour (*Delle maestranze et dell'elezione a diversi carrichi*, On workforce and the selection of different tasks), rationalising the number and composition of shipbuilding gangs, with the creation of new functionally differentiated divisions (*corpi*, literally bodies), and the constitution of gangs dedicated to specific projects within them.¹³

¹³ The seven divisions (*corpi*) are proposed as follows:

1st *corpo*: five gangs to manufacture new light galleys, each composed of 12 workers under a gang boss;

2nd *corpo*: a new enlarged group to build great galleys to be composed of 60 workers under a gang boss, who seems to be more important, as Drachio calls him *proto*, a high level foreman;

3rd *corpo*: another new collective, to be composed of 50 older workers, under a gang boss, and to undertake all preparatory and supplementary activities required in the construction of new galleys, both light and great;

4th *corpo*: a group devoted to the manufacturing of superstructural components (such as masts and spars, *calcesi* and *tagliami*), composed of 50 workers, under the foreman of mastmakers as *proto*;

5th *corpo*: five gangs to refurbish old galleys, each composed of 12 workers under a gang boss;

6th *corpo*: a collective to handle unexpected and emergency activities ('per coagiutor negli accidenti dell'Arsenal'), composed of an undefined number of workers under a gang boss;

7th *corpo*: a group, defined by negation, as 'not to undertake ironwork' ('non lavora ai ferri'), which was presumably designed to undertake indirect activities, though neither the tasks nor the number of workers are clear.

New procedures for more cost-effective use of labour power, including improvements to time-discipline and the co-ordination of work within the complex space of the Arsenal are then outlined. Those working at the first two bodies should not be allowed – Drachio suggests – to have other jobs and tasks, either inside or outside the Arsenal, 'in order that... their number would be stable'. As he puts somewhere later in the document, they 'should always come at work at the Arsenal, except right impediment for sickness or because incarcerated', and obtain extra pay for doing so. They should also be removed when reaching the age of 60, with 'the benefit that the best [workers] will be assigned to these two bodies'.

Provisions to minimise expenses are then explicitly address (*Del modo di levar le spese superflue circa le maestranze et altro*, On the means of reducing excessive expenditure on workers and elsewhere). Trying to discipline outside interference in work schedules, e.g. from demands for customised work, Drachio identifies further potential savings which are achievable by forestalling a traditional demand of ships' captains for customised work on their ships. He proposes standardising all the components required for each type of ship commissioned, setting them out in a list one by one, and then charging out any ad hoc changes to those requesting them (*sopracomiti*).

Furthermore, one of the tasks of the fourth body is made clear, as its workers are assigned to locating timbers close to the relevant jobs, and then to maintain dedicated reserves on each construction site, in order. Here a crucial accounting issue is addressed: order is necessary not just for stewardship reasons, but to know periodical outcomes 'to ensure cognition of the number and things that will be made from time to time (accidò s'habbi cognizione del numero et delle opere che si faranno di tempo in tempo)', as for instance the first number being cuts made on 1585 and the second number *tagiami* and rudders made on 1586, and so on from number to number'.

In a following chapter (*Ordine et numero dell'opere antescritte con altri avvertimenti intorno le medesime maestranze*, The order and number of the aforementioned changes, with other observations on the labour force) the above proposals are summarised in tabular forms, a sign itself of a modern way of writing that will rarely found in any other report of the period. Drachio then underlines the integrated nature of the required transformation, by proposing a new seniority structure for the *Arsenalotti*, comprising a hierarchy of just 15 senior posts. Three of them would be foremen, in charge of the all shipwrights (*marangoni*), and mastmakers (*alboranti*) plus one for the extra-large galleys respectively; in addition there would be 12 gang bosses positions. Drachio also clears

Table 3
Changes in the Drachio's and Tadini's documents on the Arsenal, 1586–96, 1593–94

<i>Major issues</i>	<i>Drachio</i>	<i>Tadini</i>
Ships Inventory	<ul style="list-style-type: none"> • Reserve gangs for arming 100 galley in case of war 	<ul style="list-style-type: none"> • Unclear reference to a lack of 50 galleys
Materials	<ul style="list-style-type: none"> • Suggested procedures to optimise the cutting, transportation and storage of oak 	<ul style="list-style-type: none"> • Inspection procedures for controlling thefts
Work force	<ul style="list-style-type: none"> • Gangs' design, workers' assignment, and definition of workforce needed • Qualitative definition of job characteristics and profiles for foremen and gang bosses 	<ul style="list-style-type: none"> • Gangs' design and workers' assignment • Criteria for gang-building aiming at responsibility
Organisational	<ul style="list-style-type: none"> • Organisation of production: standard aspects timber; redefinition of layout and 'on site' storage • Organisation of labour: disciplining the first two gangs (workers' presence on the job compulsory and till the age of 60) • Organisation of the top: centralised structure, empowered to govern the reorganisation 	<ul style="list-style-type: none"> • Organisation of labour: cogent work relationship for galley manufacturing; disciplining workers' presence on the job • Temporary and long run structures
Discourses on costs and control	<ul style="list-style-type: none"> • Incentive mechanisms for compulsory presence • Standardising the fitting out of galley's stern • Call for measuring stocks and their variation over time 	<ul style="list-style-type: none"> • Standardising the fitting out of galley's stern and its expenses • Planning and control mechanisms, involving gang bosses (semestral target and incentives; weekly and scheduling and control) and workers' élite (extra-pay for extraordinary gang members) • Normalising pay structure and aiming at controlling expenses • Calculative practice: costing organisation of labour; analysis of savings; costing on annual period

up transitional arrangements by recommending that all others who had previously been gang bosses should be assigned to the new workteams. Finally, a reserve list of specialist workers should be created, numbering 100 shipwrights, 100 caulkers and 100 oarmakers, to be called on in exceptional circumstances in case of war.

c) The overall organisational structure is finally discussed, concerning the design of a 'top' fully legitimised and empowered, with the aim of coordinating the proposed reorganisation (*Della elezione delli riformatori et creation d'uno sopravvidentente et conoscitor universal dell'Arsenal*, On the selection of reformers and the creation of a superintendent with overall knowledge). Drachio recommends the appointment of one 'superintending executive' with overall authority. This superintendent should be supported by three assistant executives (the *riformatori*), and should have the power to 'regulate, order, and reform the Arsenal,

having authority and absolute power to remove, imprison or ban workers for a period, or for life, to condemn them to the galleys or to death, to annul petitions, and override all special agreements, concessions and provisions, without any form of censure'. It is not, however, the call for personalistic kind of power: the ending of the document reveals the modern sense of this suggestion, with in embryo at least some notion of accountability, for the superintendent 'at any time should report and give account' – *ragguaglio*, which also means comparing and balancing – 'to her serenity of any material and quality of things inside the Arsenal, i.e. ...workforce and other things belonging to it'.

While the headings of points a, b and c above are surely current day terms here introduced for the sake of clarity in the exposition, the content is almost there, with the language of that time (major aspects are summarised in Table 3 using a similar headings as Table 2), and within an unusually lucid

view of managerial processes at the Arsenal, though indeed several antecedents can be found looking at the deliberations taken by the *Senato Mar* prior to Drachio's report.¹⁴

But what is clear, in the short term, is that it was somewhat counter-productive, at least if Drachio is to be believed. For his next report a decade later, *I pensieri* of 1596, recounts that he was forced to leave Venice, under threats of personal attack, 'escaping the fury of the workforce', 'badly treated', 'fearing for my health', 'confined in the hand of my enemies'.

The report – written after the rehabilitation in the Arsenal on 1594 (deliberation 1594, May 10) – is a litany of woe concerning his personal vicissitudes, adorned with high-flown tropes and metaphors bemoaning his fate: self-promoting to the last, he describes his relation to the Arsenal at one point as that of doctor to patient, a metaphor still used in relation to the diagnosis of organisational ills and 'therapies'. Indeed, some rhetorical elements are in themselves interesting for an history of management rhetoric in general: the ideal profile and characteristic of a good boss in the case of a foreman,¹⁵ a sort of job description for foremen, gang bosses and timekeeper (*appuntatori*); a list of micro 'case-studies' or incidents referring to actual events, analysing mistakes and suggesting the right behaviour. As a whole, the document is also less focussed and well-structured than the pre-

vious report. Nevertheless, it is a vehicle for Drachio to reiterate the points made in his original proposal, especially concerning the organisation of labour and the specification of meaningful production targets, and the overall command structure. Both informational and organisational accounting aspects are here referred to.

Drachio explicitly underlines the lack of (and implicitly calls for) what he sees as a crucial piece of information in managing the Arsenal, i.e. the measure of actual outcome in terms of ships produced. 'The *Serenissima Signoria* would like to know the total number of galleys built inside the Arsenal from 1536 up to now, year 1595, and specifically how many great galleys, light ones' and other kind of ships. 'Moreover, the precise number of ship made inside and those contracted out. To this question the foreman of carpenters would answer he doesn't know'.¹⁶

New insights are developed concerning the role of foremen and the need to discipline the workforce, with an interesting argument. The crucial issue is once again that of lack of stability of workers, 'a variation [which] not only concerns years and months, but also weeks, nor does this flux and reflux halt to weeks, concerning days too'. In such a situation the foreman has serious problems of 'difficulty or rather impossibility of memory', and on this basis – cognitive aspects echoing to some extent a modern notion of bounded rationality – it is suggested to allocate workers to specific tasks and controlling attendance, in order for planning and assigning labour resources to teams.

The lack of a unitary governance structure is seen as the major problem in the Arsenal, once again calling for 'one overall Head' (*un solo Riformatore*, with capital r in the original), and still calling for an huge amount of power. Here Drachio seems not satisfied by the introduction of the new position of the *provveditore alle 100 galere* (the charge of the 100 galleys to one of the Officers) established in 1588, may be as a partial answer to the question made by Drachio himself of empowering the top. The critical issue of appointing a 'permanent Superintendent' (*Soprintendente perpetuo*), someone with specific, technical knowledge to this post is stressed, suggesting that this is unlikely to be possessed by the official political appointees elected by the Senate, given the relative lack of time devoted to their role.

4.2.2. Bartolomeo Tadini (1593, 1594): the accountant's view

Tadini was an accountant (*rasonato*), employed at the Arsenal from 1588, and later as the Chief accountant (Rossi, 1997; Zannini, 1994). While little is known about the precise circumstances and reasons which led him to write his two reports, the opening of his 1593 document epitomises Tadini's

¹⁴ Already that on 1580, 12 February, anticipates the proposal of a common timber, and refers explicitly to the lack of manpower to fulfil the 100 galleys target. Tentative to regulate workforce presence can also be found in that period (cf. 1577, 15 March; 1582, 23 March), and decision to enrol further workers to increase the production capacity (1582, 14 August; 1583, 21 July; 1584, 12 January: see Table 1a for archive location details). The very controversy on contracting out (see footnote 9) not only proves the pervasiveness of this kind of managerial discourses, but can be understood as ending up with a stronger, much more aware proposal for organising the co-ordination in contracting in, given the criticism about failures and problematic results of contracting out initiatives.

¹⁵ 'However, the protohas to be sure of the truth in his discourse on managing and its arts (*discorso del suo maneggio et arte*). And when I say 'art' I have in mind both the theoretical and practical dimensions, not just the practical. For one needs to be as sure as possible, on the one hand, to avoid all visible accidents, errors and defects, but equally careful, on the other, to be alert and watchful for hidden and internal problems, and therefore to have a sufficiently well-grounded knowledge to recognise not only the external aspects of things, but their internal structural ones, so that one will genuinely know the causes of any and every accident that may occur at any time'. Drachio, *I Pensieri*, 1596.

¹⁶ To be sure, similar information has been already provided by Priuli in his report (1591): '[i]t is not out of interest to know that since 1573 a number of one hundred ninety eight light galleys came out of its Arsenal', also adding information about the production of other kind of ships, including – something that seem rather questionable – references just to great galleys. In any case, Drachio does not acknowledge this report and its data.

concerns and his accounting lens to examine the costs of the Arsenal – ‘The major expenditures of the Arsenal, consist of labour and materials’ (*La spesa della casa dell’Arsenal, importantissima, consiste in maestranze e robbe*) – and the causes of their increase. Accounting discourse thus enter more explicitly the arena than in previous reports.

On materials, he addresses once more and with a particular emphasis the problem of theft and misappropriation of materials (especially wood), suggesting a series of mechanisms to prevent or pre-empt theft. So he goes over the importance of specifying the duties of workers and officials, having strict criteria of inspection, incentives for reporting thefts and their perpetrators, and a system of reciprocal surveillance between gatekeepers and those who kept attendance registers. In addition, he pays some attention to reducing the waste deriving from production processes (like Drachio), and recommends, in relation to the upstream process of acquiring raw materials, that a register of forests be kept. Then he focuses on achieving savings reducing materials wastes and other kinds of expenses (e.g. cleaning and handling arms).

More interesting are the aspects related with the managing of the workforce, where a logic of programming and control takes place, following an initial observation on lack of, as we would put it, productivity: ‘for sure, the public [service] has nothing but 2/5 of manpower that should get from that workforce’ (*il pubblico non ha che 2/5 di lavorier che doveria haver da essa maistranza*). The issue of lack of stability in the number of workers present is then addressed, for it makes it difficult any scheduling, giving rise to a further loss: ‘it is necessary to make a forecast in order to apply the workers to work’, and to allow the gang bosses to organise the work. Two kinds of solutions are suggested by Tadini, concerning operating mechanisms and structural variables.

The focus on operating mechanisms for controlling expenses is perhaps the most innovative element, dealing in a differentiated manner with the activity of gang bosses – part of what we will label nowadays as middle-management – and of clerks, suggesting to involve them in the planning and controlling process in different ways. First, he promotes a medium-term view by explicitly introducing a six-month period for reporting over operations. At the end of each semester, the work done by each gang and its boss should be examined, with good performance receiving a monetary bonus to be shared by the team (*‘a far un donativo tra tutti’*), and poor performance being subject to sanctions and punishment, ranging from public shame up to removal of the gang boss from his position. The logic is to ‘foster processes of internal competition’ (*spingendo a concorrentia*), within an effective reward/punishment system.

Second, Tadini links this logic of medium-term planning down to the micro-level, by proposing weekly targets and appraisals. So, every Saturday, the foreman and the gang bosses should meet to make forecasts, and plan tasks and targets for the following week; work teams should then be assigned accordingly. The next Saturday – before planning for the following week – an evaluation should take place of the degree of completion of the week’s agreed work (‘re-examining whether they operated accordingly to what they have promised’) – curiously enough, the absence of workers is seen as beyond the control of the gang boss, and thus would not be a cause for sanction. It is argued that ‘this way the work will improve a lot’.

Third, Tadini (like Drachio) recommends guarding against potential outside interference leading to excess work or delay, e.g. from *sopracomiti* (ships’ captains, etc). He suggests that the required work for each ship should be strictly specified in advance, with this specification being used to regulate the work schedule thereafter.

Fourth, Tadini diffusedly in the document proposes a series of micro-level sanctions to improve attendance and quality of work, on different issues that what one could group as attempts at disciplining the workforce: he attempts to overcome Monday absences by proposing that those absent then should be forbidden to work in the Arsenal for the whole week, and those absent on following days should have their pay docked on a sliding scale; he revisits the procedures for checking off (*spuntadura*) the attendance of workers, at the beginning and end of the day; he suggests keeping a sort of register to track the movements of workers inside the Arsenal, so that at any time the location of any given worker could be identified and his activity controlled; as a corollary he stresses the importance of preventing corruption and collusion among those in charge of recording attendance.

In parallel, the 1593 document also focuses on a set of structural change, ‘to regulate the number of workers and their pay’, reducing the number of gang bosses while defining their tasks more clearly, to ensure the co-ordination of efforts. He also proposes setting up a uniform hierarchy of work grades cutting across guild boundaries, and offering a form of career progression via a gradated pay structure. This structural reform is merely outlined in the 1593 report: however, he returns to it in more detail in the 1594 one, which arguably marks a further step in the progress towards a managerial use of accounting figures.

His proposal comes in two stages. First, a temporary ad-hoc organisation of labour is proposed in order to recover the delay in the predisposition of the 100 galley reserve – explicitly acknowledging the debate which followed the Lepanto event – scheduling the emergency manufacturing of 50

galleys within a period of two years. Second, a proposal for a new and definitive organisational structure once the emergency is dealt with is described, with the aim of 'regulating the increasing expenses of the treasury' (*regolar la spesa in augmento dell'errario pubblico*). Once again the professional matrix of the accountant reappears clearly.

On the new temporary structure, a sort of two-year programme is suggested. This combines, in Tadini's words, the principles of 'order, competition, emulation, reward and punishment' (*l'ordine adunque, emulatione, premio et pena*), with the new elite workforce being made up as follows. Six special cross-functional work gangs should be formed, each with a special gang boss and a precise number of workers (30 shipwrights, six caulkers, four sawyers etc.). The gang bosses should then choose the members of their work gang on a rota basis, choosing one worker each, in turn (as children often do when they play in groups). This system would ensure that each would be careful to choose the best worker available on each turn, particularly since the quality of the work gang would directly affect a boss's own prospects; so this was an issue of personal 'honour, benefit, shame and damage' (*trattandosi del honor, utile, vergogna et danno*). Each handpicked work gang 'should be obliged to make two light galleys within six months', thus explicitly defining either a specific time frame and an outcome target. In the four semesters of the temporary programme, each of the six gangs should therefore build eight galleys, for an overall total of 48.

To ensure this target was met, an articulated set of incentives, sanctions and compensations is proposed. For each periodic target achieved, a bonus would be payable: 'a benefit for the foreman and his appointed workers, i.e. instead of six days being played seven days per week for whole x months period', which means about a 16% bonus, based on a six-day working week. In addition, gang bosses would get a bonus of 10 ducats (c 10%); however, if they failed, they could be removed from their position. In return, a strict time-discipline was proposed, whereby no member of the work gang was to be absent from the Arsenal without a specified reason. The underlying efficiency principle in this solution is stressed in Tadini's 1594 narrative: 'To compensate the community for the increase in their pay, foremen and skilled masters will have the duty to stay inside [the Arsenal] the whole day, leaving just at the evening with the rest of workers. In addition... rather than the two hours for going to lunch... I suggest they will get just one hour, for they won't have to waste the time for going home and come back... With such a solution, the community will save lots of working hours...[i.e.]...the time to

recover their tools before leaving in the morning...the time for lunch...[M]ost important, without abandoning the work site but having it in front of their eyes they will easily and without waste of time continue exactly where they stopped, with great benefit for the community and saving money'.

Finally, the special gang bosses were to be answerable to a new chief, the 'Supervisor of the six special gangs' (*provveditore delle sei capi d'opera privilegiati*), and so explicitly placed outside the existing command structures, run by the *provveditore* of the 100 galleys and the shipwrights foremen.

Once the two-year crash programme will be completed, Tadini proposes a system of production for the long term, capable to save money, as a good accountant. Two of the special gangs should be kept on, manufacturing new galleys to replace those transferred from the ships' reserve into service, with both of them retaining their elite status, under their special gang boss, and involving 30 special shipwrights, still on premium pay. While the organisation of labour for the rest of the shipwrights remains rather obscure in terms of units and tasks, what is clearly defined is a normalised structure of pay, with assumptions about the number of workers required in each labour category, and the daily cost per worker. The explicit aim is to overcome too personalist a structure, and keeping expenses under control (*regolar la spesa*).

On such a basis, in fact, Tadini then develops a calculative reasoning, devoted to estimate the savings associated with the proposed structure (Table 4). The notion of annual cost is here adopted – in a way which is explicit and aware as never found in previous documents. Starting from the total cost per day, he determines the basic monthly wage-bill (526 by 22 working days equals lire 11,572), adding also the incentives and bonuses awarded to privileged shipwrights (lire 440) and gang bosses (lire 18, soldi 6, and denari 8). Multiplying this value by 12 months, adding the further semester incentive of lire 248 to foremen, he ends up to a total annual expenses of lire 144,612, which equal ducats 23.324, lire 3, and soldi 4.

He then calculates the beneficial effects of the reorganisation, claiming that it will more than halve labour costs, given existing labour costs of 50,000 ducats. He also argues that additional benefits will accrue, via quicker completion times, materials savings, and indeed, purely through having an accurate knowledge of expenses and work done. Eventually, the value of accounting information is clearly recognised: 'we won't spend and work as in the past, where it never has been possible to know neither the expenses nor the work done, with mis-satisfaction of public [interest]'.

Table 4
Forecast of labour costs of the proposed structure by Tadini

160	Walk-clerks	at soldi	8 per day each	£.	64
160	apprentices	at soldi	20 per day each	£.	160
60	shipwrights	at soldi	24 per day each	£.	72
60	ordinary shipwrights	at soldi	30 per day each	£.	90
60	privileged shipwrights	at soldi	40 per day each	£.	120
6	ordinary foremen	at soldi	50 per day each	£.	15
2	privileged foremen	at soldi	50 per day each	£.	5
Nº 508			sums up	£.	526
I multiply by 22 – working days per month				22	
				1052	
				1052	
				£. 11572	
For 60 privileged shipwrights for the additional day every 6 days				£. 440	
For 2 privileged shipwrights				£. 18	:6.8
				£. 12030	:6.8
				12	
				24060	
				120303	:12
				.8	
				144364	:
For the bonus to foremen of ducats 10 each every six months				£. 248	:
				£. 144612	

Yearly expenses lire 144612 which is 23324 lire 3 soldi 4

Source: Tadini, 1584, p.5

4.3. Further discursive change: the diffusion of accounting innovations in the official reports (1602–1643)

The analysis of the institutional reports in the period following the presentation of the ad-hoc ones by Drachio and Tadini, corroborates the existence of discursive regularities above mentioned, but also shows the emerging of discursive changes, with the diffusion and the further development of accounting innovations. This can be found either in different ways of treating issues that were already at the centre of attention (what is here referred to as Ships inventory, Materials and components, Labour force, Broader organisational aspects), and also in the emerging of new issues, adding a new chapter in the discourse about the Arsenal: that of cost and control (Table 5).

4.3.1. Ships inventory

A crucial innovation which emerges is the determination of work-in-progress in describing the situation of ships inventory, based on the measurement of man months needed to finish the manufacturing of the various ships: 'The construction of each light galley wants the continuous work of twenty workers for the whole year' (1628). At

first confusedly emerged in the 1602 report, then from 1628 onward it is the metric always used when referring to quantify the ships' inventory (1628, 1633, 1636, 1643).

Referring to 103 ships in total, the 1633 report then describes in detail: '58 ships are new but still to be finished, and it will take months if not years to finish them: twenty of them with all the workforce will require four months; other 13 with 70 workers will be finished in 3 months, while the resting 25 require such a long time of so many workers that in the present situation are not available' (1633). Or, in a following report, it is argued that for instance that for five galleys 'which have been given a first hand ...for their completion six months with fifty carpenters and thirty caulkers each will be needed' (1643).

What this discursive innovation underlines is how weak and elusive was the previous calculative discourse on the 100 galleys issue. For if a measure of degree of completion is lacking, the question of whether the goal is achieved is almost nonsensical. On one side, the apparatus of official audit kept the target and its non-achievement simultaneously in view before the Senate (e.g. 'There are sixty-three light galleys; of those thirty-

Table 5
Discursive changes: the diffusion and development of accounting innovations

<i>Major issues</i>	<i>Accounting and management innovations</i>
Ships Inventory	<ul style="list-style-type: none"> • Measurement of w.i.p. in terms of man months
Materials	<ul style="list-style-type: none"> • W.i.p. in man months for components as well • Procedures for warehouse movements • Detailed expenses forecasts for purchasing materials • Analysis of yearly consumption and causes Work force • Calculative practices on manpower starting from unitary parameters (man months per ship)
Organisational aspects	<ul style="list-style-type: none"> • Organisation of production: procedures for defining interventions on old galleys; reasoned contracting-out proposal • Organisation of the top: proposal to lengthen the position of the responsible of the 100 galleys
Discourses on costs and control	<ul style="list-style-type: none"> • Establishment of mechanisms for operating control: <ul style="list-style-type: none"> – tracing elementary costs – aggregation as cost per galley – systematic use of yearly consumption • Use of aggregated expenses data (personnel and total costs) • Self-redefinition of the output level, proposing to reduce the 100 galley

seven could be completed using the whole workforce': 1628); on the other, accounting and other measures of performance calculation were being articulated. A coalescing of audit and accounting technologies can be seen here in the new metric. Such a condensed means of measuring time and labour resources required, once developed, offered self-evident advantages over the old practice of simply recording 'number of ships under construction'. Not only did such a number give no idea of degree (or likelihood) of completion, it might often refer to the same ships across reports. The new number made it possible to make delays on individual ships visible, but also to aggregate the labour requirements across all ships under construction and repair (e.g. 1633), and thus to match resources available to projects on a priority basis. Used in this way, the man-months measure could become another way of circumscribing the power of individual shipwrights, as a secondary measure making possible precise aggregation, summary measures and predictions.

4.3.2 Materials and components

Similarly, accounting innovations in managerial measures of control begin to appear in relation to materials and components. First, a measurement of work-in-progress is developed not just for ships as a whole but for key components, such as the number of oars required to outfit a galley under repair: 'To fulfil the number of sixty five galleys twenty oars set are needed, which...will be fitted out in about nine months, give that in five days one oars set is made' (1628). Second, while initial reports were used to simply list the physical quantity

needed, now a monetary forecast of the expense is also provided: 'For light galleys twenty oars sets missing will cost, at 200 ducats each, 4 thousands ducats...Mast needed....will cost altogether 210 ducats.' and so on (1628). In addition, recommendations are made for better and detailed procedures for controlling the movement of materials into and out of storehouses, including indirect and little-used materials, given the inner complexity of the construction processes in shipbuilding: 'Galleys are similar to clocks: if the most banal of its tools and components breaks, the whole motion will be halted, and all the resting components will stay unfruitful' (1633).

4.3.3. Labour force

The shortage of workers at this time is an issue explicitly discussed in several reports (1591, 1602, 1628, 1633), particularly after the plague in 1631: compared to the almost 2,500 enrolled in 1565 Molin refers to only 1,118. More than the information per se, innovations here largely consist in refining the application of the techniques just outlined to determine the workforce required, for managerial purposes. For instance, the report of 1628 by Morosini states that 'the building of each light galley requires the continuous work of twenty workers for the whole year, and cost to Her Serenity about eight thousands ducats'. Molin brings the reasoning a step further, as he begins to determine the need for work teams starting from the amount of man-months required per ship, comparing it with workforce available: 'In order to prepare five light galleys and one great galley eight hundred man ...are needed on a continuous

base for six months, that means four hundred man for the whole year. With no more than a number ...of three hundreds sixty three among carpenters and caulkers it is clear that workforce is missing' for the work to be done (1633). This calculation leads him to conclude that the workforce then available in the Arsenal was just sufficient for the refurbishment of old galleys, but not for building new ones. On this basis, he makes a specific proposal, which is accepted, to use contracting out policies (*sopra di sé*): at such moments, the work process begins to be systematically 'managed by numbers'.

4.3.4. Broader organisational issues

Interesting innovations take place also in terms of the organisation of production processes and related operating mechanisms. Molin's report (1633) in particular reveals a strong architectonic grasp of the need for integration, and apply this vision to the organisation of construction activity generally: he calls for the development of a procedure to decide on the kind of work to be done in ships refurbishment; he proposes a decision rule for contracting out, suggesting that those operations should be kept inside, which were most critical for the seaworthiness and longevity of the ship; he reintroduces a call for motivation via incentives; he suggests that the *provveditore* of the 100 galleys should remain in post for a longer period, to give him time to acquire in-depth knowledge on technical issues.

4.3.5. A new chapter: cost and control issues, and the redefinition of the galley reserve

Almost 30 years after Tadini's reports, references to notions of cost and economic resources appear increasingly diffused throughout the institutional reports, delivering accounting discourse and its use for managerial purposes.

Accounting innovation takes place in several ways. First, reference to elementary costs are widespread in the last reports (especially from 1628 onward). For instance 'The anchors for a great galley....cost six hundred and ninety ducats. For each light galley four are needed...and want one hundred sixty-eight ducats' (1633). In contrast to data previously seen, this is not the price associated to the purchasing of a particular item in the list of what is needed: it is a more abstract notion of cost in itself.

Second, the aggregation of elementary cost

brings a new issue in the agenda, i.e. the notion of consumption per ship which then can allow by aggregation the calculation of the cost per galley: 'The mere ship of any galley...costs around twenty-five thousands ducats, and it takes two years time and no less to build one of those vessels, with the continuous work of at least forty men' (1528). The report by Molin – surely the most interesting of the period, deserving a paper on its own following that of Forsellini (1930) – will provide a more detailed picture with different subtotal (the construction of the vessel, its fitting out, munitions, and arms) and articulated on 20 items.¹⁷

Third, it must be stressed that such information is being used within a decision-making frame. Comparative analysis is undertaken about annual patterns of materials consumption, with investigation of the sources of increases. For instance, he need to reduce wastage the use of oars by the fleet is suggested by Molin, who points out that between 1609–10 and 1632–33 'the present consumption almost doubled', also arguing that 'each oar of light galley costs to Her Excellency five ducats' and thus has a direct impact on the expenses of the Arsenal.

Fourth, a tendency to aggregate costs and expenses for the whole Arsenal can be found, with notion of aggregate expenses being used diffusely, also in relations with some sort of institutional reform of the administrative system of the Republic as such (for a first inquiry cf. Zambon and Zan, 1998). The information provided is rather poor at first: 'Your Serenity spends every year more than two hundreds fifty ducats in her Arsenal,...and the workforce counts for about eighty thousands' (1624). A more precise figure is provided at the end of the period of investigation: 'The ordinary expenses (*la spesa ordinaria*) reach the amount of two hundreds seventy two ducats per year, current expenses being workforce one hundred forty three and three hundred sixty four, provisions six thousand eight two, material eighty thousand four hundred forty three, rents two thousand five hundred thirty six, wine nineteen thousand two hundred and two, building one thousand one hundred ninety four' (1643).

But there is possibly a final accounting innovation which had relevant implications. One particularly interesting feature, vis-à-vis the evolution of managerial discourses in the Arsenal, is that, in the most elaborate reports, the accounting-based recording of all these problems and contradictions in the production processes at the Arsenal led their authors to begin questioning the overall possibility/feasibility of the 100 galleys goal. In the beginning this appears to happen in an offhand kind of way, with the suggestion that the purchase order for oak and materials be made on the basis of more realistic needs, considering a target of 75 light gal-

¹⁷ Forsellini already suggested a systematic inventory accounting process must have been in place, in order to derive cost per galley calculations. The time-lag between Tadini and the 1628–1644 reports itself is intriguing, demanding further archival investigation into how accountants were able to construct metrics which captured such data in the managing of direct operations, and transfer them into daily practice.

leys plus seven extra-large galleys (1628). However, the role of accounting and production data is clearly integral to the calculations of the unsustainable nature of the 100 plus 12 galley target, due to lack of production capacity.¹⁸ '[T]he lack of material and the small number of active workers not allowing to fulfil the reserve as ordered by public deliberations', Molin (1633) comes up with a specific proposal, of halving the target (50 plus six). The following reports then either implicitly base their calculation of purchasing needs on this assumption (1636), or simply do not address explicitly the issue (i.e. stating what is needed without referring to the number of galleys to be finished).

5. Discussion: management and accounting discourses and change processes

The very description of the whole set of complex documents – and the length itself of the description – is a strong sign of the importance of management and accounting discourse in such a proto-industrial setting, well before the industrial and the managerial revolution: more than referring to the ‘costing renaissance’ and its antecedents in the British Industrial Revolution (as in Fleischman and Parker, 1990), indeed, the importance of costing in the Renaissance is here addressed. The material analysed both strengthens and calls for further development in that particular stream of research, trying to avoid shared biases in mainstreams in accounting, business and economic history (Hopwood, 1987, 1992; Ezzamel et al., 1990; Miller and Napier, 1993; Ezzamel, 1994; Boyns and Edwards, 1996; Gaffikin, 1998; Merino, 1998; Tyson, 1998; Carmona and Zan, 2002). For the *discorso del maneggio* is something much older than the inventions of management as we know it in the 20th and 19th centuries, or even in the 18th century (Mepham, 1988; Edwards and Boyns, 1992; Bhimani, 1994; Nikitin, 1996; Carmona et al., 1997; Scorgie, 1997). Accounting – at least the Venetian method as it was used in Venice, at its Arsenal – was much more than simply book-keeping even at that time; and, indeed, it seems to have had a much more direct impact than generally assumed in the evolution of capitalism, as in Sombart’s view (in a sense confirming Miller and Napier’s view, 1993, with a partial exception I will come back to at the end of the article).

What particularly strikes me is the systematic reasoning inside most of these reports, on the one hand, and on the other the linkages between the different documents inside a common ‘talk’ about managing issues, activities and resources – ‘an ensembles of practices and rationales’ as Miller and Napier (1993: 633) will put it, or as part of ‘collective movements’ (Gaffikin, 1998: 634) – a dialogue evolving over time with its discursive regularities and changes. Moreover, it is the interaction between management *and* accounting which is particularly interesting, with accounting innovations of the last reports fostering management discourse. Finally, what can be underlined is the modern use of these notions in both sense making *and* – i.e. not only – power relationship (or ‘human accountability’, as referred to by Hoskin and Macve). In this sense some comments would help in grasping the overall meanings of this archive material (cf. also Tables 3, 4 and 5).

5.1. *The discorso del maneggio and accounting innovations*

Already before Drachio, indeed, important antecedents show the existence of an on-going debate and talk of a modern kind, whose basic outcome, for what here matters, is in itself the emerging of the norm (1580) establishing a flux of reports on managing issues. The day-to-day experience of work is translated into a number of major discursive chapters, referring to ships inventory, materials and components, and the labour force; and through these chapters a new level of discourse is articulated, concerned with those meta-levels of activity, now rendered open to reflection and planning, which I see in thus also inventing a more abstract and indirect concerns with what is here designated as ‘the organisational’ level.

The discursive changes by Drachio are however meaningful, for what is striking here is the lucid and systematic way in which Drachio sees the whole issue of organising, in terms of organisation of production and logistics (procedures for managing wood and materials; standardisation of design characteristics, i.e. the ‘common timber’; redefinition of productive layout), organisation of labour (gang system; mechanisms for a more effective control of presence), and overall organisational structure (empowered ‘top’). Second, it betrays a view driven by a moral imperative of efficiency – though this term is not used as such – especially referring to production times and waste, so that labour efficiency seems in a sense to be instrumental or subordinate to the concern of saving materials. Interesting enough, this has nothing to do with any notion of profit maximisation (similarly to Ezzamel et al., 1990), but rather with a logic of common good, or public interest both in military

¹⁸ Given that such observations were being made more implicitly before the plague, this situation can be seen not to have been caused by the latter – however it may have been a critical precipitating factor in the move to explicit re-thinking, as may have been the financial problems posed by the plague for the state’s revenue base, with consequent limitations in budget assignments to the Arsenal (1636).

and economic terms, inside an organisation which cannot even be characterised as profit-seeking, nor even as a firm, but rather as a public body not operating on the market¹⁹ (with a further interesting convergence with the research agenda for accounting history set out in the introduction to this article – and particularly with Carmona et al., 1997; Carmona and Zan, 2002; Nikitin, 1996; Alvarez-Dardet et al., 2002; Donoso, 2002; Boyn and Carmona, 2002; Jurado-Sanchez, 2002; Llopis et al., 2002; Carmona and Gomez, 2002; Nunez 2002 – and with non-Chandlerian business and economic research as for instance the work on the India Company, cf. Bruijn, 1989, and Gaastra and Bruijn, 1993, and on proto-industrial settings, cf. Braunstein, 1990, 2001; Stabel, 2000; Arnoux, 2001). Third, a new view of labour relationships emerge, based on an early form of performative principle (e.g. when proposing to move master when ageing 60). Fourth, the specific solutions proposed by Drachio show a robust knowledge of the Arsenal, plus an awareness of the principle of managing problems, with a capability to abstract and generalise, an approach which is therefore grounded in a form of self-reflective reasoning and analysis.

The importance of the Tadini's reports is similarly difficult to overstress. First, there is the realisation that a structurally new organisation of work must be articulated fully and precisely, if the guild-based regulation of work is to be broken. The integration of functions into work gangs is the means to achieve this. Second, there is the grasp of the way such organised activity can improve both the transformation of resources and the control of costs, thus recognising the integral value of accounting-based calculation, in the process of managing a large and complex organisation. Third, there is the imposition of a new order of time, to ensure that the model structure will produce actual results. The specification of standardised work periods of manageable yet more than short-term length, the setting of targets for those periods, and the decomposition of work within each period into

short-term targets, with constant audit of performance – these are the keys to getting results, period on period, over the long term.

Indeed, considering Tadini's and Drachio's reports, the impression is that of a profound discursive change, wherein a systematic new set of things begin to be said in a systematically new way. The discontinuity by their reports are not, however, isolated examples, for the following reports by officials seem to be largely influenced by them – wherein the *discorso del maneggio* gets incorporated into the narrative agendas of the official reports, for political as well as technical/managerial reasons – representing in their turn further innovations. New accounting notions emerge, and are further applied to the *discorso del maneggio*, as (modern) ways to use calculative practices for legitimating issues, strengthening sense making processes, giving priority, attention and visibility to issues of concern of the actors (Hopwood, 1987; Miller and Napier, 1993): the metric of man-month for measuring the ships' inventory and its components, the calculation and aggregation of costs in terms of cost per galley and the expense of the Arsenal by class of materials and in total, the development of analyses on consumption etc., confirming the conclusion by Edwards and Newell (1990: 53) about uses of cost estimates in the 16th century (already in Melis, 1950). On the whole, more sophisticated solutions are suggested for production process procedures (for instance reasoned contracting-out proposal; procedures for defining interventions on old galleys); new ways of thinking of and representing production processes emerge, how to talk, conceptualise and measure them, as for instance with the construction of a notion of work-in-progress in terms of man-months. Even a more precise discourse on the economic takes shape, for discussion is not limited to the articulation of new concepts and notions in terms of consumption, costs and expenses, but also expands to consider the social construction of organisational arenas wherein there is a new use of data on costs and resources within calculative practices (as for instance to measure resource – especially labour – and expected outcome).

All this takes place in a context that can be defined as undergoing a process of managerialisation, with an emergent self-determination of basic goals following an appreciation by key actors of the unsustainable character of the 100 galleys reserve. Here a process can be seen where the perceptions and discourses of technical managers and state officials begin to merge.²⁰ In short, a change is underway from a fairly narrow technical-executive way of seeing in and around the workplace (focused on technical issues in the execution of passively taken-for-granted commands) to a more broadly perspectival organisational-decisional

¹⁹ In that sense, the 'anomaly', the emerging of the 'new' is rather represented by the change from this situation to a more profit oriented one, as for instance in the case of the Royal tobacco monopoly in the late 19th century (Macias, 2002).

²⁰ Here an important aspect should be deepened in the future, trying to better understand the meanings and hint in which one can apply the current notion of 'managers' to different actors in the Arsenal. The problem in fact – as always with language – is that the term manager itself tends to incorporate a current perception of managerial processes as particular ways of structuring governance structures. So while the whole group of elected officers (*savi, provveditori* etc.) did play an important role in the managing of the Arsenal, it is hard to call them 'managers'; but some of them, as for instance people like Molin, really seems to play a role of a modern manger, similar to that of Drachio, and perhaps more than other internal professionals in the Arsenal.

one; 'managerialist' at least in a broad sense (Boyns and Edwards, 1996; Tyson, 1998), if not in the narrow one.²¹

In assessing the meaning of these reports and contributions at the Arsenal, one could wonder to what extent were they the brilliant intuition of individuals, or to what extent had they an impact, if any. Although, in the writer's view, the intrinsic value of these contributions can be found in their own way of producing a new rhetoric on managing issue also if no impact at all would have occurred, however there are important signs in this direction. For instance, the fact that these kind of documents continue until 1781 is an indirect sign of impact. More directly, the introduction of the *provveditore* at the 100 galleys can be interpreted as a (moderate) response to Drachio's call for an empowered top. Moreover, the reduction of the gap between enrolled and active workers shown by Davis (1991) can be seen as another consequence (indeed, drawing on his figures [p. 13] it can be noticed that the ratio tends to reach a level around 60–70% since 1645). But without doubt the major impact is the self-reduction in the level of the Arsenal outcome, self-reducing the reserve from 100 to 50 galleys.

There is a final research question that needs to be addressed, related to the strange mixture of order and chaos that emerged, according to the reports. Indeed, a seemingly antithetical trend can be found between two different kinds of phenomena. On the one hand, disorder seem to persist at the level of co-ordinating technical production: waste and difficulties in co-ordination continue to be referred to in most of the reports, suggesting a situation where an underlying problem has not yet been solved. This suggests that waste and inefficiency were increasing – though, alternatively, it could simply be the sign of a new visibility for such elements, as part itself of new discourse along with a new readiness to diagnose and offer solutions. On the other hand, in the institutional reports following those of Drachio and Tadini, the oft-repeated concerns with the problems of disciplining the labour force seem to disappear. Generic lamentations on the laziness and idleness of workers give place to more focused questions referring to work force (e.g. talking about the specific issue of the relation between apprentices and masters), in a sense translating it into an organisational variable (if not reifying it), in calculative practices on resource needs. That may be a sign that the problem of disciplining work force is much reduced in this period. Such a contradiction between the relative lack of success in handling direct production problems and its analytical complexity, and the ability to articulate and handle the relational complexity of work force issues – largely contrasting with Lane's (1934) results – cannot be understood by invoking some idea of a generic

improvement in the managing process and capabilities, for one would expect the quality of managers to operate in both directions.

Rather, a more problematic view of accounting change should be adopted (Hopwood, 1987), leaving room for contradictions, inconsistencies, unanticipated consequences, and to some extent to 'dissociate outcomes from beginnings' (Miller and Napier, 1993: 632). In short, a more complex reinterpretation of change processes taking place at the Arsenal in the period is needed. With possible implications on the interpretation of the overall meaning of the reform at the turn of the 16th century as referred to by Venice historians, 'rereading and reconceptualising known sources', as Merino (1998: 607) will put it; and with deeper understanding of the role played by management and accounting in the transformation processes of this public entity.

5.2. Management and accounting innovations and changes processes, 1581–1643

Given the inner discursive complexities, innovations in management and accounting practices at the Arsenal can be better understood according to a multidimensional, interdisciplinary interpretation (in this sense cf. Miller et al., 1991: 399; Parker, 1999; Richardson and MacDonald, 2002: 75). Without bothering the reader too much, and leaving the discussion on the writer's epistemology to another occasion, while at a general level I share a view of accounting change as 'history of organisational construction' (Hopwood, 1987: 211) within a 'genealogy of calculation' perspective (Miller and Napier, 1993), from an operational point of view I will here use in a broad sense some of the notions and perspectives of the literature on change processes (e.g. Normann, 1977; Mintzberg, 1978, 1994; Pettigrew, 1985; Zan, 1995; Zan et al.,

²¹ Broad or narrow? What is sure is that the following words – used by Loft (1991: 33) to sum up the world before managerialism as seen by Hoskin and Macve (1986, 1988) – hardly apply to the Arsenal context: '...for many centuries the use of accounting hardly spread and there was little technical development... Accounting tended to be a sporadically updated record of the past; it was not concerned with the future – in other words, the coherent network, in time, of disciplinary techniques which surround work in our society. Planning and budgeting before work was carried out, measurement during the processes, and checking afterwards, were absent'.

²² Though the strategic content of any proposals (as well as the organisational context) at the Arsenal is unlikely to have much in common in substantive terms with what is generally discussed in current strategy literature, a judicious use of such work can help making sense of the new wider dynamics of what get said and thought within and around this organisational space. This also allows one to import the interactionist perspective focussed on the interplay between the 'actor and the system' or the calls for a dialectical tension between deterministic and voluntary assumptions in organisation theories, thus enriching what is usually approached by new (and old) accounting history.

1993).²² Three variables can be identified: a technology variable, given the influences exerted by technological changes or developments in the design and production processes; an organisational variable, referring to the way in which the Arsenal was in the process of becoming a newly organised entity, as discourses and practices of co-ordination define its external and internal boundaries in new ways; and finally an actor-related variable, necessary to acknowledge and respect the roles of individuals (cf. Astley and Van de Ven, 1983; Bourgeois, 1984), in saying and doing new things, or old things in new ways. For what is here provided is not a socially determined analysis (Crozier and Friedberg, 1977; Zan, 1995): while there are technological and organisational factors at work, they work only through the actions of, and interactions with, specific individuals, particularly those who are the authors of new 'managerial' and accounting practices and discursive regularities and changes.

5.2.1. The technological variable: from making-to-order to making-for-stock

There is an important change taking place inside the broader process of evolution of the Arsenal, still characterised toward the second half of the 16th century as a 'hybrid organisation', where labour is already internalised but still largely out of control. What, in retrospect at least, seems crucial – the catalyst for the following multidimensional changes – is the decision by the Senate to build up the 100 galley reserve, or, better, the decision to seriously adopt it after the Lepanto battle, on a permanent basis.

This decision gives rise to what in current terms can be labelled as a major technological shift in the organisation of construction processes at the Arsenal. The focus and boundary of the technological regime changes, as the decision immediately implies that 100 ships must be manufactured and/or preserved in parallel, forcing the managing elite and shipwrights to change the logic of production from one of making to order towards one of making for stock. One direct consequence of this is to transform the Arsenal into immense storage space, which then also has to be perceived and described officially as such a space. Within this

huge space, smaller specific spaces need to be identified, and then organised, for the storing of material; such spaces need to be aligned with production spaces to speed up and smooth out the translation of materials from a raw to finished state. Immediately, the need for co-ordination, and a discourse on co-ordination, begins to increase considerably. The previous informal types of planning and control practices begin to be seen as a lack of planning and control, and as things to be reformed before their bad effects become acute. Perceptual and cognitive difficulties appear now visible in dealing with time and succession of operations and tasks, co-ordinating and carrying out the different steps of production within the manufacturing cycle, in planning purchasing and so on.

This is perhaps the reason why the problem of co-ordination should emerge so strongly as a discursive issue, and why the perception of chaos persists in the reports of the time, and may even increase in the last ones. In other words, the problems of this period is not due to a generic decline in managing capability (for it is unlikely that in the 15th and 16th centuries the Arsenal was better run and managed). Rather, though in previous periods it was badly organised in a similar way, the effects of this problematic organisation were fewer because production was not forced to conform to a logic of permanent production for stock, and numbers of ships under construction, and of related activities, were likely to be far smaller than the 100 galleys with a higher number of workers.²³

Note that the technological breakthrough as such happened as an exogenous event, in terms of the picture one can draw. It was not integral or centrally important to the development of economic, managerial discourses *within* the Arsenal, neither was it produced as a necessary consequence of focussing on internal issues of control. Rather, it is the outcome of the military and strategic decision to build to a reserve, born therefore of a concern with wider political issues: if there is an economic reason to be found, it is perhaps to be found at the general, abstract level of a macro-economic explanation, in relation to the perceived importance of protecting trading activities of the Republic.

5.2.2. Organisational action, or enacted organisation: the emerging of the performative logic

One may argue that it was the innovations in management and accounting discourse which made it possible, necessary and worthwhile to introduce changes in logistic and technical production procedures. They also promoted a search for new forms of discipline of labour, both at the level of structural interventions – the organisation of functional gangs, the re-definition of hierarchical chains of command etc. – and at that of operating mechanisms, from the regulation of workers' pres-

²² Before the 1537 war it was not impossible to produce 50 galley frames in 10 months – as Lane, 1934 observes – however as a extraordinary event, without a logic of permanent production to stock. Indeed it should be noticed that even today managing the construction of a reserve of 100 ships would be a hard task, notwithstanding the availability of current project management technologies such as the bill of materials and Pert or C.P.M. techniques. Such issues have surfaced rarely, however, in the historiography on the Arsenal to date, perhaps because of a lack of awareness about the difficulties involved in implementing such accounting and management technologies.

ence to the involvement of intermediate organisational level in managerial processes, with forms of (to some extent still in embryo) modern organisational control.

However, in such a process of 'construction of organisational order' (Hopwood, 1987: 214) it is worth noting a crucial asymmetry in the way power effects take place. In general, questions about internal power over workers recede, but they remain articulated as problematic at the top. In one respect, from a modern perspective indeed, the institutional design of the organisation and its interface with the Senate still follow a pre-modern organisational logic. However, Drachio first thinks outside this logic, with his proposal to extend the term of office for the *provveditore* of the 100 galleys to promote better management and control. At the same time, if the power problems remain unsolved, there is at least a considerable expansion in the managerialisation of the Arsenal: for instance, in the call for a reduction in the 100 galleys target; and in the adoption of a more specialist accounting knowledge about the organisation and costs of the Arsenal, which up to a point may have marked these officials off from non-expert members of the Senate and circumscribed the ability of the latter to control the Arsenal, though formally still being its 'owners'.

Interestingly, the material shows one final limit to what may be said, discursively. For where 'good' managerial proposals fail to coincide with accepted social norms and rules, they remain virtually unheard, and unsayable. No one illustrates this better than Drachio. His work challenges the interests and norms of virtually all groups of people involved in the Arsenal. He challenges the traditional power of the individual skilled artisan (e.g. with the attack on the individual craftsmen's ownership rights and identity, by the recommendation for holding timber in common). He sets up conflict with gang bosses, by reducing their discretion over the organisation of labour and prescribing the work to be undertaken in the refurbishment and customisation of galleys. His proposals also challenge the autonomy of other senior workers (over issues of disciplining labour attendance and activity, and reducing the misappropriation of materials). He even encroaches on the territory of the Senate and the state government, as the body ultimately responsible for the good running of the Arsenal, with his call for culling old and non-productive workers from the payroll. Here his reforms would have disrupted wider social arrangements, e.g. the trade-off for the state through granting this form of 'welfare' to a critical body of workers (consider the recommendation by Drachio to remove masters of the two crucial gangs from their position at the age of 60).

His diagnosis of what is wrong is indeed robust,

and to me persuasive, e.g. when he calls for the introduction of a unique reformer (*Riformatore unico*). But if power is needed to bring order in the Arsenal, such a discourse on power must cope with the existing social order, specially concerning the entrenched interests which will be damaged by the establishment of a logic of efficiency and performance. When Drachio, in his impolitic way, calls for the right of life and death, the right to annul sentences and decisions made by other institutional bodies of the Republic, and when he criticises the institutional tradition of rotation for elected position because of the negative impact of these institutional behaviours on efficiency, then the management discourse founders on the rock of the social and political norms of the Venetian Republic, with its complicated sense of justice, relative commitment to civil rights, and to a redundancy of bodies as a means of counteracting concentrations of power and enforcing a balancing between them (see Lane). If seeing in depth the contradictions between a 'new world' and the 'old' one – in the fundamental conflicts posed by the needs and imperatives of efficiency – is costly on a personal basis for Drachio himself, such naïveté seems to underline the historical difficulty of the establishment of a reasonable and socially acceptable discourse on management, which is not something natural nor given. But after just a few years, Drachio himself is rehabilitated, and the same performative logic seem to be shared in the following reports. In this sense, one of the most interesting elements in the Arsenal event is the chronicle at the micro-level of the establishing of the modern sense of the economic (*à la Polanyi*).

5.2.3. *Actors and enactment processes: a double transformation*

As clearly stated by the current literature on accounting, organisational and strategic change, however, the relation between environmental changes and organisational responses is far from being of a deterministic nature, nor is it neutral, taking place in aseptic contexts (cf. for instance Pettigrew, 1973; Normann, 1977; Crozier and Friedberg, 1977; Hopwood, 1987). The role of actors in linking the effects of these two variables needs to be recognised, with an emphasis on the quasi-autonomous role of individuals in gaining attention, structuring agendas and mobilising collective action, still leaving room for the emerging, the unanticipated. It is particularly the cognitive aspects that deserve further attention. Here, actors make explicit and rationalise the new production paradigm (the technological shift from on order to storage production) and the associated needs and conditions for planning, to a great extent refining and cognitively structuring the logic of operations already acted but still not conceptualised.

There is one particular complex discursive transformation that takes place here, reshaping action significantly: a particular case of attributing 'meanings and significance...to particular ways of calculating' (Miller and Napier, 1993: 639), which I see as crucial to understand the overall change process, and which can hardly be reduced in my view to a mere issue of 'human accountability', as for instance in the Hoskin and Macve research programme. This can be referred to as a double translation of conceptual categories, a joint shift from the physical realm to the economic, and from a view of stock to one of flows. Such a translation does not embrace all agents automatically or immediately. Here it begins to be articulated first among the key actors at the operational level, rather than the political one.

To the political counterpart of Arsenal's affairs, the Senate, what was relevant throughout this period was simply a goal defined in substantive (physical) terms, and, in addition, as a stock. What mattered was to have the reserve of 100 ships for military security. Traditionally the actors inside the Arsenal had shared in that goal, which is perhaps why the official reports, especially the earlier ones, put a great emphasis on describing the stock of ships, rather than on periodical or yearly outcomes. In order to achieve such physical and stock goals, those managing the Arsenal increasingly found themselves entangled in a complex process, which was out of their control. For they had to effect the co-ordination of flows of resources of different kinds, within a context of heterogeneous production involving both light and large galleys, all at different degrees of completion, and all being constructed under contracts for work agreed with individual master shipwrights, who were free to divide their time between state and private work.

It is at that point that a new view came into consideration, and the very notion of level of outcome became being articulated: first as the measurement of cumulated production of galleys for the period 1573–1591 by Priuli, than as a still confused call for yearly production measurement by Drachio, and finally enacted as normal output level by Molin.

Here accounting innovations (in Tadini and following reports) become crucial, allowing to link production and resources. On the one hand, the transformation of stock concepts into flow ones required the fabrication of new time-sensitive, dynamic notions of measurement. On the other, such a transformation could only be articulated when such notions were to hand. The major breakthrough was the move to measuring work-in-progress for ship production, measuring the amount of work to be done against the manpower required to do it. Given this metric, the unrealistic nature of the 100-galleys target could come to be

articulated, whereas previously it was literally impossible to address this problem (indeed in the absence of a similar sort of calculus the goal is essentially unspecifiable). Now the measurement of work-in-progress in terms of man months allowed internal actors to talk about the 100-galleys goal in terms of degree of realisation. In the end, this conceptual breakthrough towards the conceptualisation and representation of 'work-in-progress' is a crucial element in the enactment process, soon followed by other kinds of accounting innovations as tracing costs – annual costs – and calculating aggregate costs (per galley, per item, etc.).

All this transformed into terms of daily experienced concreteness, and into conceptually manageable terms, what was previously an exogenous goal (of 100 galleys), expressible only in an inaccessible, even foreign language (in a sense translating the issue of the 100 galleys from its original substantive meaning to a formal reasoning, once again in Polanyi's words). A genuinely new discursive category, the target, could now be put into operation in a way that could meet the demands of – and so be consistent with the logic of – the policy-making entity, the Senate. At the same time, through this category, the traditional goal could now be rendered meaningful to those who were in charge of 'getting things done', using a modern expression, in a way that finally enabled them to comprehend and so manage, at a discursive level, the whole technical production process from beginning to end.

As soon as the enactment of these metrics took place, and the implications of producing for the 100 galleys target are cleared, the consciousness emerge of the impossibility to achieve the target, it became then possible for an agent who could prove that implication, on the basis of calculation via the metric, to say the previously unsayable, and suggest reducing the target to a more realistic level (the lack of resources – wood, labour and money – are the reasons explicitly provided by Molin and Lion reports for justifying the reduction of the reserve, indeed).

In an irony of history, one of the earliest documented example of the 'feedback mechanism' show that targets more than actions tend to be acted upon (this also provides an interesting historical grounds to the literature on decision making processes which radically questions the means/end model: cf. March and Olsen, 1986; March, 1988). In this sense, the change processes of the Arsenal over the period considered here could be described, paraphrasing the well-known expression, as 'the rise and fall of the 100 galleys issue'. The episode began with the initial decision to set this target, then passed through the long years of failure to achieve it, to end up in the articulation of the

measured and measurement-based view that it was, in fact, technically and economically unfeasible. Not that this was purely an episode of failure. On the contrary, the transformation of the Arsenal from a hybrid entity to something closer to a more thorough notion of organisation in a modern sense is to be found precisely in the role here played by accounting and management discourse.

6. Concluding remarks: limitations and delimitations of the research

A few concluding remarks are useful in order to better understand the meaning of this piece of research, at least in the author's eyes. In this sense some important limitations (issues which the author was unable to solve, so far) and delimitation (issues which were out of primary interests of this article) in the research strategy here adopted can be pointed out.

First, as often with historical analysis, just a first tentative interpretation of the sense of relevant reports and documents was here possible. Important parts of the puzzle are still missing, as for instance the whole set of accounting rules in the wider accounting system adopted by the Republic, which had surely played an important role in the evolution of the documents that are here referred to, especially in explaining the improvements in accounting discourse – and technicalities – which followed Tadini's reports. Important questions are left unsolved, deserving future investigation, already in progress (cf. Zambon and Zan, 1998; Zambon 1997, 1998).

Second, the focus here has been on accounting talks and procedures more than on substantive elements and figures per se. The latter of course would be of a great interest, but requires a more robust understanding of the nature of data and information available – a sort of 'critique of sources' as Cipolla (1988: ch. 4) will put it – from an accounting point of view, which is here pursued. Unfortunately, if Dal Borgo (in progress research) is right, this limitation will be hard to overcome in the future, given the destruction of accounting books and records.

Third, the time horizon is here focused on the turn of the century, while possible investigation on similar reports will call for additional research in the future, close to the end of the Republic. It is not merely an issue of the aesthetics of completeness, but rather to investigate the persistence of accounting and management discourse at the Arsenal. Archive research is in progress as part of the broader research project (with S. Zambon, M. Dal Borgo and F. Rossi).

As far as delimitations, and in order to avoid possible misunderstanding, it is worth stressing that the main interest of this article is in-depth archive research more than a detailed discussion

on historical debate and historiography. This is an indirect criticism of the excess of non-archival research, which characterises recent years in accounting history literature, particularly on the issue of genesis and diffusion of accounting and management innovation. Apart from the overtones that tend to characterise the juxtaposition between 'new' and 'old' and sharing the call for tolerance and variety (Merino, 1998: 607; Carnegie and Napier, 1996, 2002; Carmona and Zan, 2002), I would resist to bend the Arsenal archive findings to the issue of the 'genesis of managerialism' as discussed in the literature, for several reasons concerning both terms – and indeed on these basis the co-authorship with Keith Hoskin at the initial stage of this research (Hoskin and Zan, 1997) was condemned to wreck.

First, I still have problems in understanding exactly what managerialism means according to the 'true interpretation'. On these aspects I tend to share the view by Boyns and Edwards (1996, 2000) and Tyson (1998), despite the reply by Hoskin and Macve (2000); in addition, the narrower way of defining managerialism seems to me a specifically US and UK element (as partially acknowledged by Ezzamel et al. 1990) even at present, for most of current day successful Italian firms – SME, districts, network firms – will hardly meet similar requests.

Though in any case, to a significant extent, important elements of 'human accountability' can be found in the Arsenal event, the issue of it being 'managerialist' or not does not seem particularly interesting to me: for what matters is a question of forms, degrees, elements of modernity, rather than treating it as a yes/no test, perhaps compared to an ideal benchmark (Springfield Armoury or whatever). On the other hand, at an earlier stage of that debate, Ezzamel et al. (1990: 157) were open minded toward the possible discovery of new forms, rate, places of managerialism, and almost prophetic of my findings of the Arsenal: 'There is indeed no a priori reason why this event should not have occurred at any point following the invention of double entry book-keeping in the late 13th century. Whatever the earliest theoretical demonstration or practical example we know of now, in the years' time we are almost certain to have found others'.

Moreover, the elements of modernity in the Arsenal are not merely related to the – however present – issue of human accountability: they relate to other aspects of importance, such as the establishment of the performative principle; a process of construction of the economic in the formal rather than the substantive terms (which here takes the form of what has been referred to as the double transformation: from the physical realm to resources, and from stock to flows); the self-re-

duction of production level as an element of autonomous direction; and the operationalisation of all this matter into accounting measurements as described in these pages.

Second, the whole issue of 'genesis' seems to me problematic (here in disagreement with Boyns and Edwards, 2000, on this aspect sharing the Hoskin and Macve position). At the epistemological level I rather tend to share those views in a sense decoupling the present from its antecedents, focusing on 'outcomes of the past, rather than looking for the origins of the present' (e.g. Miller and Napier, 1993: 632; cf. also Hopwood, 1987; Merino, 1998; Zan, 1994, 2001). More practically, I am not arguing here that what I found was unique to Venice at the time, nor am I saying that the genesis of modern management took place there and spread outwards into the rest of the world. What is unique – if anything – is the richness of the Venice archives in the kind of documents that allow an investigation into the practices of management at the time: in other words, it is the practices of 'giving account' of the Arsenal embedded in the tradition of reporting of the Republic that represent a particularly interesting aspect of this context, for it allows an inference process about the ways in which managing issues of such an organisation were conceptualised. It may well be that in the same period there was a similarly well developed managerial discourse elsewhere, that simply needs to be looked at in the right archives (as Ezzamel et al., 1990, already suggested): the question of the dissemination of the management discourse is more an empirical issue that the present research did not address. Indeed, it is rather likely that the so-called 'spread of the Venetian method' was something more than simply book-keeping, as conventionally accepted in accounting historiography. But mechanisms, patterns, and modes of diffusion – if any – to other geographical areas or kinds of organisation are research questions for the future. Whether it was unique or not, it survived or decayed over time, it was a crucial point in the diffusion of management and accounting knowledge or not, it is not relevant for what I wanted to focus on in this article: simply reconstructing and understanding what it was in its time.

A few differences remain compared to the 'genealogists' (in particular Miller and Napier, 1993: 639): that of being entranced by examples prior to the 18th century, as proto-industrial settings; concerning economic organisations which are not necessarily firms and questioning what can be labelled as 'firm-centrism', and with particular interest in the role of State-bureaucracy in the development of management and accounting discourse; and consequently – at least within the Western world – moving back to a more European focus.

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CALL FOR PAPERS

GOVERNANCE WITHOUT GOVERNMENT: NEW FORMS OF GOVERNANCE IN THE KNOWLEDGE ECONOMY AND SOCIETY

**An international agenda-setting conference
Cardiff Business School, Cardiff, Wales; 11-13 May 2005**

The rise of the knowledge economy and society from 1980s onwards has radically de-stabilised the seemingly ordered and stable ‘governance systems’ that emerged in the OECD countries after the Second World War. The cumulative effect of the complex interaction between globalisation, ‘informationalisation’, ‘individualisation’ and ‘marketisation’ also seem to undermine the ideological foundations and political viability of governance strategies and structures dominated by the logic of rational bureaucratic organisation and control. In addition, a protracted sequence of relatively spectacular ‘governance failures’ over the last four decades (from ‘bargained corporatism’ to the ‘enterprise culture’) has forced social scientists and policy makers to reconsider both the intellectual frameworks and institutional forms through which organisational co-ordination and control is understood and implemented. Overall, there seems to be a long-term shift away from forms of governance based on bureaucratic hierarchy to more complex, hybridised forms in which self-renewing networks play a more pivotal role. In turn, the latter is seen to be more consistent with the emphasis on governing through extended inter-organisational networks and the ‘new localism’ that now dominates policy thinking and implementation.

We appear to be entering an era of *‘governance without government’*; a policy-making environment in which co-ordinating power and control is shared between the major ‘collective actors’, requiring more sophisticated organising mechanisms to make it possible. The underlying dynamic and trajectory of change in governance systems suggests a move away from the ‘hierarchy paradigm’ towards the ‘network paradigm’. This shift in governance introduces a higher degree of decision-making complexity. In particular, the decoupling of previously vertically integrated corporate decision-making hierarchies, in both the private and public sectors, presents intractable co-ordinating and control problems. Nevertheless, these developments seem to demand innovative ways of thinking about and practising the ‘new arts of network governance’.

The conference is intended to provide a forum for international academics and policy makers in which the new forms and systems of governance associated with the rise of the knowledge economy and society can be debated and evaluated. Conference sessions will include plenaries, open fora and paper presentations. Three plenary presentations will be given by distinguished international speakers: David Cooper (Alberta), Barbara Czarniawski (Göteborg) and Stan Deetz (Colorado). The fora (on, respectively, ‘knowledge’, ‘identity’, ‘money’ and ‘ethics’) will be facilitated by Frank Blackler (Lancaster), Hugh Willmott (Cambridge), Prem Sikka (Essex) and Barbara Townley (Edinburgh). Extended abstracts of no less than 1,000 words to be submitted to **Ezzamel@Cardiff.ac.uk** no later than **31 October 2004** and notification of acceptance will be received within six weeks of the deadline.

Book reviews

The Management of Intellectual Capital and its Implications for Business Reporting. *Robin Fincham and Robin Roslender*, Institute of Chartered Accountants of Scotland, Edinburgh, 2003. vii + 85 pp. £15.

The market capitalisation of listed companies in the western world far exceeds the value of these companies' tangible assets as recorded on their balance sheets. This discrepancy is commonly believed to represent the intangible values of a company such as its intellectual capital. Strangely, however, there is limited research into this topic. This research report, by researchers well-versed in the area is, therefore, a welcome contribution to the debate.

The research report comprises two main parts. In the first part, the authors review the pertinent academic literature in three-linked chapters. This is followed by two related interview studies: the first into six UK companies and the second with 10 UK experts. Below the strengths and weaknesses of the literature review and interviews are first evaluated and then the study's conclusions reviewed.

1. The literature review

The literature review is in three parts. In the first part (ch. 2), intellectual capital is defined and various concepts such as value realisation, value creation, intangibles and intangible assets are discussed. Perhaps it is the nature of the subject, but I found this chapter enigmatic. This was particularly true in the discussion of how intellectual capital should be defined. At Skandia, a Swedish company, 'intellectual capital' was defined as 'human capital together with "those dimensions beyond the human capital [that] were left behind when the staff went home", structural capital having grown out of human capital' (p.7). Later on in the chapter, the authors present their own summary of intellectual capital. 'Intellectual capital can be divided into three relatively "concrete" components: one relating to human abilities, another to internal organisational structure, and a third to external structure. In addition, it has occurred to later commentators that a fourth somewhat elusive (but no less important) component needs to be specified, namely the innovative capabilities that flow from intellectual capital, and which could, perhaps, be seen as a sum total of these other three elements, or the result of their correct alignment'

(p.10). I know that intellectual capital is an elusive topic. However, this summary definition failed to enlighten me. This is a great shame as one clear finding from the case studies was that the term 'intellectual capital' itself was not well understood.

Elsewhere in Chapter 2, however, there was some informative and interesting material. For example, a discussion of Skandia's value scheme and a taxonomy of intellectual capital. There was also a useful section which looked at value realisation versus value creation, intangibles, intellectual capital and human capital. This discussion would have benefited from a clear glossary of terms.

Chapter 3 looked at wider business and management issues dealing with corporate and organisational cultures, the information society and the new economy. Although interesting, I wondered why this merited a separate chapter. It seemed to me of only tangential relevance. This was compounded by the absence in the literature review of certain topics that seemed more relevant: strategic management accounting, accounting for risk, the professional literature and problems with current accounting. Strategic management accounting and accounting for risk appear to be relevant to the intellectual capital debate. Indeed, strategic management accounting in textbooks usually covers topics such as the balanced scorecard, and Porter's value added model both of which are discussed in this report. Risk accounting is also very much concerned with intangibles. However, neither subject is formally discussed – even if to be rapidly dismissed. Similarly, professional accountancy firms such as PricewaterhouseCoopers have long discussed intangibles/intellectual capital. However, no coverage of their activities is included. Finally, the shortcomings of current financial reporting are discussed, but only late on in pages 62 and 72–73. I found this discussion interesting, but too late: Surely, the reason why we need to account for intellectual capital is because conventional accounting is failing, if not failing. This case, I believe, would have been more convincingly made up-front.

Chapter 4 looked at frameworks for intellectual capital reporting. After all the discussion about the innovative nature of intellectual capital, I was somewhat disappointed to be greeted by 'old friends': balanced scorecards, value chain scorecards and narrative-based statements. All seemed

familiar, old ideas adapted to a new intellectual capital reporting framework. It is not the authors' fault that these new initiatives resemble the techniques adopted in strategic management accounting for decades. However, I was hoping that I would be greeted by some revolutionary new ideas. If the authors can develop these in their future work, they will indeed make an important intellectual and practical contribution.

2. Interviews

There were two sets of interviews. In one set, the field studies, 22 interviews took place with six case companies (from the following sectors: computer software, computer hardware, information provider, financial products, management consultancy and petrochemicals). In the second set, 12 interviews took place (four cognate experts in knowledge management and intellectual property; two senior accountants; an influential figure in the 'Peoplism' market; a senior adviser; two senior bank lending officials and two city-based investment analysts). A semi-structured interview checklist was used.

One of the potential problems with interview studies, lack of generalisability, is tackled well and head-on on page 42. 'Qualitative sampling is a type of purposive sampling (as opposed to statistical sampling) that does not attempt to generalise to a population. It generalises to a theory, or set of propositions.' I have no quarrel with this statement. I did, however, expect 'a theory or a set of propositions' to emerge from the research. I did not find this.

There was also a lack of background description so that the case study findings could be contextualised. This is all the more disappointing because the authors state, and I agree: Case studies '...are holistic in that they allow the history and background of an issue to be taken into account as well as a variety of data sources; they permit enquiry at the level of explanation rather than merely description' (p.42). Finally, I would also have welcomed more information on how the interviews themselves were analysed.

The interview findings were undoubtedly the highlight of the report, especially the use of 'real-life' quotes. In fact, I often wished for more real quotations. Some of the main findings from the case studies and the experts are summarised below.

From the case study interviews, the main findings were as follows. First, intellectual capital is not a widely used term. Second, the term knowledge management is more widely understood. Third, there is a general lack of integrated thinking especially in the case of the balanced scorecard. Fourth, there is some awareness of the need to identify successfully and manage the various components of intellectual capital (such as human cap-

ital, relational capital and structural capital). Fifth, there are many instances of the development of predominantly non-financial measurement metrics. Sixth, the UK lags behind the Nordic countries.

The main findings from the interviews with the experts were that, first, there is little concerted effort to manage or report on intellectual capital in the UK. Second, there is some effort to redress the situation, particularly reliance on 'coherent management narrative' (p.71). Third, expert opinion is 'under-informed by theoretical insights' (p.71).

Conclusions

Overall, the authors come to the somewhat depressing conclusion that 'while management in the case companies might not have much understanding about the "theory" that is associated with intellectual capital, they did recognise *what* they should be accounting for, and *why* they should be doing so. Ultimately, however, the lack of a theoretical perspective resulted in limited thinking on how they should go about the tasks in a systematic way' (p.71).

The authors' recommendations after all this work are, it is fair to say, fairly modest. First, they believe that companies and government policy makers need to identify and measure intellectual capital. Second, they believe that 'a scorecard approach provides the necessary basis for intellectual capital reporting' (p.74). Third, 'it is necessary to make greater use of a narrative approach to reporting' (p.75). And, fourth, they advocate the development of a 'more progressive genre of Intellectual Capital Self-Accounts' (p.75). More details on the specific operationalisation of these approaches would have been welcome.

Overall, therefore, this report covers an important area of accounting and one which will undoubtedly grow in significance. The literature review is informative, but somewhat limited. The case studies are interesting and show that much more needs to be done if the UK is to take intellectual capital seriously. For those wishing to gain an insight into the current scope of intellectual capital in the UK, this is a good starting place.

Cardiff Business School

Mike Jones

Accounting, Accountants and Accountability Poststructuralist Positions. Norman Belding Macintosh. Routledge, 2002, 164 pp.

It is always a great pleasure to read anything by Norman Macintosh. Fortunately, I have had this pleasure for many years – and probably for more years than either of us would like to admit to! We share a common interest in the importance of 'intellectual borrowings' from other social science disciplines to help make sense of the role of accounting and accountability in organisations and

society. Norman Macintosh has always been at the forefront of these processes as well as in the forefront of the now worldwide Interdisciplinary Perspectives on Accounting and Accountability academic community which has been working on these 'borrowings' over what is now in excess of a quarter of a century.

Norman Macintosh has always been one of the great eclectic thinkers in accounting, making it difficult to either label or categorise him, but maybe – only maybe – his real heart and soul is in poststructuralist thinking, to which this current work is addressed. He has been an advocate of many notable thinkers (e.g., Giddens and Habermas) over the years. However, each time some form of closure surrounds him that leads to any stereotyping he re-emerges as something often ontologically opposed to his previous seemingly clear position. This characteristic is why probably a poststructuralist perspective is really his real theoretical home. If there is one over-riding perspective of poststructuralism it is that closure in understanding will always be restrictive, should be avoided and, in the final analysis, is impossible. This book develops this theme with considerable skill and with great perception. Maybe – but I could not say for certain; it is, for Macintosh, the place where he really likes to be.

The place to start to read this book is with Chapter 6 – this is, of course, a book about poststructuralism so why start at the beginning! – set within the context of Chapters 1 and 2. Chapter 6, particularly, sets the theoretical context for the argument Macintosh is advancing. It can best be summarised as coming from what he refers to as the '*crisis of representation*' (p.114) in accounting and in other forms of truth claims. This '...refers to the widespread loss of faith in the belief that language, writing, discourse, discursive practices, and so on, can adequately bring the true meaning of some out-there *thing-in-itself* into our presence' (p.114) (emphasis in the original). For those who are worrying that this leads to an increasing meaningless to the idea of trying to depict 'reality' – Baudrillard's 'hyperreality', discussed so ably in Chapter 4, could be seen as arguing for just that – Macintosh is at pains to point out that '...this is not to claim that there is no 'brute reality' out there. Rather it is to say that it is an impossible task to represent the truth of it in language. We live in language and cannot get out of it to describe reality' (p.116). As a way out of this – to some, a sobering – impasse, is through what can be termed 'coherence theory', which recognises that complex terms (e.g. in accounting, 'profit') are not expected to have a clear correspondence in reality but are given truth value through cohering with 'experience and beliefs' (p.116).

So, put crudely, if everyone believes this is what

profit is then that is what it is! Yet, as Macintosh so perceptively indicates, this is living a lie and can collapse at any time. Blowing the whistle on the emperor's new clothes comes to mind at this point. But this story, of course, is based on some 'real reality' breaking in to perceptions. This is not what Macintosh has in mind and he would be the first to point out that such 'scales falling from eyes' when reality intervenes is an impossibility. It is rather that coherence theory creates a false, artificial closure which restricts the linguistic journey to understanding which Macintosh, in other parts of the book, wants to show has no end, and certainly not an end which brings an exhaustive description of 'reality'.

This undermining of commonly held beliefs concerning accounting's role does not, however, signal the 'end' of accounting. As Macintosh makes plain:

'Instead it clears a space for posing a new set of questions. Crucially these do not include concerns such as 'Can accounting reports be prepared to reflect in a transparent manner true income and capital?'. Rather, very different concerns surface, including genealogical investigations into issues such as: 'How do relations of power relate to the truthfulness of accounting regimes and discourse?' How do accounting regimes of truth get appropriated as truth perspectives? and What is the value of valuing accounting regimes of truth? These questions precipitate new ways of thinking about accounting and truth.' (p.115)

It is these new set of questions and different ways to look at them which is the dominant theme and positive contribution of this book. Poststructuralist thought (where the 'post' refers to going '...past, coming after or going beyond structuralism' (p.13) (emphasis in the original) it is argued, provides these possibilities. This is needed since there are very real dangers in structuralism or so Macintosh would have us believe. So, for instance, in the context of textual interpretation: '...instead of opening up the text to multiple readings, structuralism wanted to close down the multiple meanings and *terrorize* the text' (p.13) (emphasis in the original).

This predominance with textual theorists and textual analysis dominates Chapters 3 and 4 and is returned to in Chapter 7, where the work of Mikhail Bakhtin is introduced as the source for developing a way forward for accounting. A brief introduction is provided in Chapter 2 to the importance of 'genealogy' for textual analysis and the centrality of Nietzsche for all poststructuralist genealogical analysts. This is followed by a highly insightful journey in Chapters 3 and 4 through the thinking of Barthes ('..for its semiotic nature'

[p.4]), Derrida ('..for its duplicity in constructing meaning' [p.4]) to Baudrillard ('...for its hyper-textuality' [p.4]). The finale for this excursion is contained in Chapter 7 with the work of Bakhtin.

However, before looking at this finale, it is important to look at the rather different form of genealogy, discussed in Chapter 5, related to the work of Michel Foucault. Unlike the other post-structuralists, discussed in the book, Foucault is less interested in a genealogy of texts and more interested in 'punitive and disciplinary discourses' (p.4) and the way these mould and change social situations. While Foucault is interested in the 'power-knowledge' disciplinary practices in the formation of the subject, at various points in time his thinking has been extensively used to look at the disciplinary processes of accounting systems. This chapter provides an excellent introduction to Foucauldian thinking, both generally and specifically in relation to accounting. While, to Macintosh, Foucault is an extension of the post-structuralist aim – which he describes as '...to show how the 'talk' – the texts, discourses, and discursive formations – dominates the 'walk' – the relations of power and exploitation' (p.15) – it is possible to read his work as being more concerned with the 'walk' rather than directly with the 'talk'. As such, therefore, Foucault is closer to addressing some of the more 'structural' 'new' questions (see above quote from page 115) that relate directly to the 'walk' concerns.

Yet Macintosh draws us back from these debates in Chapter 7 to the issues again of 'talk'. Perhaps the real reason is a prescriptive one – something poststructuralist usually avoid. But as Macintosh points out '[I]f we talk in new and radical ways, the walk can and might be different' (p.15). Yet what he offers us in the concluding chapter is not these connections through to the walk but a new model of talk, which he describes as 'heteroglossic accounting'. He links this to the thinking of the Russian literary theorist Mikhail Bakhtin. Heteroglossia involves '...defined and multi-voiced, discursive acts [which] ensures that meaning stays alive, in process, unfinished and engaged in a continuous social dialogue' (p.130). A heteroglossic novel '...gives equal weight to the voices

of both characters and the author...and...the characters' and the author's views are contradictory, developing and unfinished' (p.129). The aim of heteroglossic accounting would be to '...produce a report that allows the various 'voices' currently embedded, but muffled in the monologic report to 'speak'" (p.131). Where this 'speak' goes and its repercussions for the 'walk' is deliberately left open, since that is the entire point of the move from structuralism to poststructuralism.

This short book is a *tour de force* and, as with all Norman Macintosh's work, is well written in an easy, engaging style that leaves the reader with much to think about. Its closure at the end is a call for openness, as might be expected from the post-structuralist argument being propounded. I am sure Norman would expect me to have many problems with accepting the poststructuralist thesis – which of course I do. This is probably not the place to go into the reasons for this difference of views, except to say that although I share the rejection of the simple structuralist model that he advances this does not mean that poststructuralism is the answer. Taking a Hegelian rather than Nietzschean branching from Kant comes to a very different set of solutions. It is a solution I, for one, find more appealing since it critically engages with an analysis of the 'real' repercussions that comes from 'actual' accounting and accountability systems in 'actual' organisations. Foucault gets closest to this analysis and thus closer to some of the more 'structural' 'new' questions generated by the demise of simple structuralist claims. But, as Macintosh makes plain, Foucault is an historian of discontinuity where one disciplinary power-knowledge framework is simply *different* to, rather than *better or worse than*, another – a view I find difficult to accept. However, these are disagreements that are well recognised and well discussed as Norman and I have done on many occasions. This should not detract from my strong recommendation for all those who have long followed these debates to read and think through the important issues raised in this excellent book.

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Guide for Authors

General

Papers should be in English and consist of original unpublished work not currently being considered for publication elsewhere. They should be typed and double-spaced. Four copies should be submitted, together with a submission fee of £18 for subscribers or £36 for non-subscribers. The submission fee should be paid by cheque or draft made payable to *Lancaster University*. Payment cannot be made by credit card. In order to ensure an anonymous review, authors should not identify themselves, directly or indirectly. Experience has shown that papers that have already benefited from critical comment from colleagues at seminars or at conferences have a much better chance of acceptance. Where the research takes the form of field surveys or experiments, four copies of the instrument should be submitted. Where the paper shares data with another paper, a copy of the other paper must also be provided. In the case of papers accepted for publication, authors will be asked to provide a Word disk version of the manuscript, along with a hard copy version. Authors of accepted papers will also be asked to transfer copyright to the publishers.

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Tippett, M. and Whittington, G. (1995). 'An empirical evaluation of an induced theory of financial ratios'. *Accounting and Business Research*, 25: 208–218.
Watts, R. L. and Zimmerman, J. L. (1986). *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Style and spelling

Abbreviations of institutional names should be written as, for example, FASB and not F.A.S.B.; those of Latin terms should contain stops (thus i.e. not ie). Words such as 'realise' should be spelled with an 's' not a 'z'. Single quotation marks should be used, not double.

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Disclosure compliance with national accounting standards by listed companies in South Asia

Muhammad Jahangir Ali, Kamran Ahmed, Darren Henry*

Abstract—This paper empirically examines the level of compliance with disclosure requirements mandated by 14 national accounting standards for a large sample of companies within the three major countries in South Asia, namely India, Pakistan and Bangladesh, and evaluates the corporate attributes which influence the degree of compliance with these standards. Using a scoring system to develop a total compliance index (TCI) for each sample company, the results indicate significant variation in total disclosure compliance levels across countries and different national accounting standards. Compliance levels are found to be positively related to company size, profitability and multinational-company status, and unrelated to leverage levels and the quality of external auditors.

1. Introduction

Financial reporting that provides relevant and reliable information is vital to the growth and development of capital markets within emerging nations. However, the level of disclosure of adequate and reliable information by companies in emerging nations lags behind developed western capital markets, and regulatory bodies are less effective in enforcing the existing accounting regulations. The government regulatory bodies and the accounting and auditing profession suffer from structural weaknesses and often take a lenient attitude that results in wide scale violations of exact accounting and securities regulations by companies (Saudagaran, 2001:171–72). Consequently, overseas investors often are hesitant to invest in companies operating in emerging nations due to the lack of transparency and lack of acceptance with internationally recognised reporting standards.

Emerging nations in need of external finance from both private and institutional sources in order to augment domestic growth and economic well-being have been under pressure to improve the quality of corporate financial reporting. To this end, revamping age-old company legislations and

developing accounting and reporting systems acceptable and understandable to international investors have become an important policy issue confronting the emerging nations. Expediency has led the majority of these countries to converge towards use of International Accounting Standards (IASs)¹ developed by the International Accounting Standards Board (IASB), particularly considering the huge commitment of scarce resources and inherent risk of non-acceptance by multinational corporations and international capital financers. Countries within the Asia-Pacific region have mostly adopted the IASs issued by the IASB, either wholly or with minor modifications, and have amended company and securities legislations in line with the growing trend towards international harmonization (Saudagaran and Diga, 1997). Countries within South Asia such as Bangladesh, India and Pakistan have adopted a similar approach to improving financial reporting. As outlined in Section 2 below, listed companies in Pakistan are legislatively required to comply with IASs (which have been adopted as national standards in these countries), whereas Bangladeshi and Indian companies are required to comply with national accounting standards, which are, in effect, modified IASs. The accounting professional bodies in these countries have also established a regional body called the South Asian Federation of

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¹ International Accounting Standards (IASs) are now known as International Financial Reporting Standards (IFRSs). The term IAS is used for reference purposes throughout this paper, as these were effective in the 1998 financial reporting year period investigated in this paper. Also, this paper is not evaluating disclosure compliance with IASs directly, rather with national accounting standards in India, Pakistan and Bangladesh which are developed in part or full from IASs.

Accountants (SAFA) with a view to improving accounting and reporting practices in the region within the framework of the South Asian Regional Cooperation (SARC).²

Bangladesh, India and Pakistan, together formerly known as the Indian sub-continent, were part of the British Empire before their independence in 1947. These countries occupy an important position in the Asian region in terms of geographical location, population and economic potential. The stock markets in all three countries have been in existence for more than 80 years and have experienced rapid growth in recent times both in terms of the number of listed companies and volume of trading. These countries pursued a mixed economic development policy that allowed the state-owned enterprises to dominate private enterprises in the production, employment and distribution of economic resources until late 1980s. However, in pursuance with open economic policies, the governments of these countries began to attract foreign investment by lifting restrictions that protected inefficient state-owned enterprises. As a result, overseas direct investment and participation in the securities markets in these countries have increased many fold, state ownership in the productive sector has reduced and private sector investments have expanded. At the end of 1998, the total market capitalisation of the stock exchanges in Bangladesh, India and Pakistan was about US\$1,034m, US\$105,188m and US\$5,418m, respectively (IFC, 1999), with each country achieving positive economic growth in the last decade. In 1998, there were 5,860 firms listed on the Mumbai (formerly Bombay) Stock Exchange in India, which is the second largest in the world based on the number of listed firms. During that year, foreign direct investment was US\$317m in Bangladesh, US\$2,258m in India and US\$497m in Pakistan. Several companies from this region have now been included in the global equity index (IFC, 1999).

Prior disclosure literature has concentrated primarily on compliance with IASs (see Nobes, 1990; Street et al., 1999; and Street and Bryant, 2000) and limited research has been conducted relating to corporate disclosure compliance with national accounting standards. Within the Asia-Pacific countries, Tai et al. (1990) identified 10 mandatory disclosure items and assessed whether companies listed on the Hong Kong Stock Exchange comply with those items. Based on a sample of 76 companies, they observed an average non-compliance rate of 22%, ranging between a high of 49% in depreciation accounting for fixed assets and a low of 4% for extraordinary items. They also

found a significant negative association between the extent of non-compliance and company size, but no significant relationship was noted for the size of company audit firms and business type. Ng and Koh (1994) examined compliance level with non-mandatory accounting pronouncements in the 1986 annual financial statements of 106 companies in Singapore. Their results showed that the companies that were large, profitable, and highly leveraged were more likely to comply with non-mandatory accounting pronouncements. They also found that companies in the industrial and commercial sectors had higher compliance level and companies audited by large public accounting firms were more likely to comply with non-mandatory disclosure provisions than those audited by small public accounting firms.

Ahmed and Nicholls (1994) examined the extent of statutory information disclosure in the corporate annual reports of listed non-financial companies and the impact of selected key company attributes on the degree of disclosure compliance with accounting regulatory statutes in Bangladesh. They found that none of the sampled companies complied fully with the existing financial regulations. The linear regression results showed that classification as subsidiaries of multinational companies and the utilisation of large audit firms had a significant positive impact on the extent of disclosure compliance. In contrast, the qualifications of the principal accounting officer of a reporting company had less influence on disclosure compliance.

Wallace and Naser (1995) assessed the comprehensiveness of 30 mandatory disclosure items in the corporate annual reports of 85 listed firms in Hong Kong between 1988 and 1992. They found a statistically significant association between the comprehensiveness of mandatory disclosure and firm's book value of total assets, and no significant relationship between mandatory disclosure and managerial ownership and leverage. However, they found a negative relationship between disclosure level and whether or not the firm appointed a Big-6 audit firm.

Tan and Tower (1999) examined whether the country of origin, industry, company size and leverage had an impact on the disclosure compliance within the 186 half-yearly reports for the year 1995–96 for companies in Australia and Singapore. They found evidence that the compliance level within Singaporean companies was significantly higher than for their Australian counterparts. The other variables – industry, leverage and company size – were not found to be statistically significant determinants of disclosure compliance.

Turning to other emerging countries, Wallace (1988) examined 47 stock exchange-listed companies in Nigeria and concluded that many compa-

² Other member countries are Sri Lanka, Nepal, Bhutan and Maldives.

nies in that country publish annual reports that do not adequately comply with minimum disclosure regulation. The lowest level of compliance was found to be with the directors' report with 24 companies not meeting all legal requirements. Even in the case of the balance sheet where the highest level of compliance was noted, about 33% of the companies sampled failed to disclose all mandatory information. Wallace (1988) found a significant positive impact of the extent of equity participation of multinational companies on the level of compliance.

Owusu-Ansah (1998) and Owusu-Ansah (2000) examined disclosure compliance of 49 listed companies for the year 1994 with mandatory disclosure regulations in Zimbabwe. Owusu-Ansah (2000) finds that disclosure compliance with mandatory disclosure regulations was around 52.6%, ranging from a high of 100% (revenue recognition) to a low of 0% in five areas. Owusu-Ansah (1998) also finds that the variability in disclosure compliance is significantly positively ($p<0.05$) associated with corporate attributes such as profitability, company age and whether or not the firms have affiliations with multinational corporations.

The primary focus of the current study is to examine to extent to which listed companies in Bangladesh, India and Pakistan comply with selected national accounting standards and the extent to which corporate characteristics are associated with compliance with these national standards. To our knowledge, no substantive comparative study has been undertaken to examine the extent of accounting standard disclosure compliance within South Asian countries using a large sample. As a result, investors, both domestic and overseas, are not fully informed about the quality of reporting by companies in these countries. The present paper fills this gap in our understanding by examining the extent of compliance with national accounting standards and the determinants of such compliance using a sample of 566 listed companies drawn from Bangladesh, India and Pakistan.

The remainder of the paper is structured as follows. Section 2 outlines the legal and institutional framework for corporate reporting in South Asia, Section 3 describes the manner in which disclosure compliance is measured in this study, followed by a description of the corporate attributes thought to influence disclosure compliance in Section 4. Section 5 outlines the data collection and model

development for the paper, Section 6 provides the descriptive statistics and regression results and conclusions are drawn in Section 7.

2. The legal and institutional framework for corporate financial reporting in South Asia

Corporate financial accounting and reporting by public companies in India, Pakistan and Bangladesh is largely governed by the Companies Act and professional accounting bodies, which are modelled on the British system introduced during the British colonial era. In addition to rules and regulations embedded in the Act, professional accounting bodies are empowered to promulgate accounting standards, which are primarily based on IASs. For publicly listed companies, there are further listing rules and accounting provisions contained in the securities and exchange rules/ordinance and are implemented by the stock exchanges and securities and exchange authorities within each country.³

2.1. The legal framework

The primary source of the current companies acts in India, Pakistan and Bangladesh is the Companies Act 1913, adopted in the Indian sub-continent during the British colonial rule which was modelled on the British Companies Act 1908. The 1913 Act was amended several times before and subsequent to the independence of these countries. The current legislation that primarily governs corporate reporting in these countries are the Companies Act, 1956 in India, the Companies Ordinance, 1984 in Pakistan, and the Companies Act, 1994 in Bangladesh. These acts require companies, among others, to keep proper books of accounts and to prepare and send financial statements to their shareholders in order to reflect a *true and fair view* of the state of affairs of the company. These laws also require companies to verify their accounts and express an opinion thereon by independent auditors, as defined in the Act of each country, within a specified time from the financial year-end date.

For listed companies, all three countries have separate securities and exchange acts to protect investors, and to monitor the issuing of securities, directors' rights and responsibilities, and financial reporting with a view to promote and broaden the capital market. In India, the relevant body is the Securities and Exchange Board of India (SEBI) which was set up in April 1988 by replacing the earlier organisation established in 1956. In Pakistan, the Securities and Exchange Commission of Pakistan (SECP) was formed as an autonomous body in 1997 to replace the department within the Ministry of Finance formed in 1972. A similar structure is in place in Bangladesh

³ The increasing emphasis and importance of stock exchange authorities and their regulations relating to disclosure in annual reports in South Asia is likely to reflect an increasing influence from the US, particularly since the independence of South Asia from the UK and the inception of the European Union (EU) and membership of the EU by the UK.

Table 1
National accounting standards and corresponding IASs in Bangladesh, India and Pakistan

		<i>Present accounting standard</i>	<i>Number of items in the Index</i>	<i>Bangladesh BAS</i>	<i>India AS</i>	<i>Pakistan IAS</i>
1	IAS 2	Inventories	9	2	2	2
2	IAS 7	Cash flow statements	14	3	3	7
3	IAS 8	Net profit or loss for the period, fundamental errors and changes in accounting policies	11	8	5	8
4	IAS 9	Research and development costs	6	9	8	9
5	IAS 12	Accounting for taxes on income	7	12	22	12
6	IAS 16	Property, plant and equipment	14	16	10	16
7	IAS 17	Accounting for leases	8	17	19	17
8	IAS 19	Retirement benefit costs	11	19	15	19
9	IAS 20	Accounting for government grants and Disclosure of government assistance	5	20	12	20
10	IAS 21	Effect of changes in foreign currency exchange rates	5	21	11	21
11	IAS 22	Business combinations	15	22	14	22
12	IAS 23	Borrowing costs	3	23	16	23
13	IAS 25	Accounting for investment	18	25	13	25
14	IAS 28	Accounting for investment in associates	5	28	23	28

based on the Securities and Exchange Rules, 1987. The securities authorities in all three countries require all listed companies to comply with accounting standards promulgated by the professional accounting bodies empowered for this purpose, in addition to meeting relevant disclosure requirements contained in securities regulations.

2.2. Professional accounting in South Asia

Professional accounting bodies have been in existence in South Asia for more than 80 years following the establishment of the first professional organisation in the Indian subcontinent, the Society for Professional Accountants, in 1922. At present there are two main professional bodies in each country: (1) the Institute of Chartered Accountants, and (2) the Institute of Cost and Management (Works, in India) Accountants. Members of the Institute of Chartered Accountants are eligible to verify corporate financial accounts and statements and express an independent opinion on these. However, in recent years the provision for cost audits has been incorporated in company legislation and members of the Cost and Management Institute are now eligible to undertake cost audits of state enterprises.

Both institutes in each country are member bodies of the International Federation of Accountants and the International Accounting Standards Board (IASB), and are committed to supporting efforts of the IASB towards international harmonisation by complying with standards promulgated by the board. To this end, each country has initiated legislative and institutional structures to enhance

compliance and thus to improve the quality of financial reporting. In India, the ICAI has been at the forefront of standard-setting activities with the establishment of the Accounting Standard Board (ASB) to harmonise the accounting practices in India, in 1977. However, a new National Advisory Committee on Accounting Standards (NAC) was established at the initiative of the central government in association with the Institute of Chartered Accountants of India (ICAI) and other professional, financial and government organisations to adopt/modify international accounting standards in conformity with Indian environments. These standards, once adopted, are required to be followed by all listed companies. In Pakistan, the National Committee for Steering IASs, the Institute of Chartered Accountants of Pakistan (ICAP) and the Institute of Cost and Management Accountants of Pakistan (ICMAP) review all IASs and intimate to the Securities and Exchange Commission of Pakistan (SECP) to issue notification. The IASs are then used as national standards through company legislation (section 234 of Companies Ordinance, 1984) and are mandatory for all listed companies (section 42 of the SEC Ordinance). A similar arrangement is in place in Bangladesh. The technical committee of both accounting bodies review IASs and adopt these either with minor or without modifications (which are then called Bangladesh Accounting Standards) (IASB, 1997). These standards obtain mandatory status for listing companies through the Securities and Exchange Commission's (SEC) directives.

It is an obvious question to what extent these national standards are different from the IASs. Although it is claimed that IASs are modified before the adoption within each country, in practice the standards are adopted without any modifications in Pakistan and Bangladesh (Wallace, 1990; Hossain, 1999; Hossain and Islam, 2002⁴) and with minor modifications in India (Ghosh, 2000), suggesting that the differences, if they exist, would be minimal. Nobes (2000), however, suggests that there are significant differences or inconsistencies between Indian national accounting standards and IASs, and also differences between Pakistan accounting requirements and IASs. These differences, particularly for Pakistan and Bangladesh, primarily relate to IASs which have not been adopted as national standards in these countries. Table 1 shows the 14 national accounting standards and equivalent IASs relating to accounting and reporting requirements within Bangladesh, India and Pakistan effective at the end of 1998.

3. Measuring compliance with national accounting standards

We adopted a quantitative approach to measuring the extent of compliance level rather than relying on companies' claims of compliance to a particular accounting standard (Dumontier and Raffournier, 1998). As stated previously, we selected for analysis the 14 common national accounting standards which have all been adopted by India, Pakistan and Bangladesh as their national accounting standards at the end of 1998. The starting point for this analysis was the reading of all 14 selected national accounting standards⁵ for each country and the development of a check-list comprising 131 items required by these 14 standards, in each country, to be disclosed.⁶ In doing so, prior studies (Ahmed and Nicholls, 1994; Chamisa, 2000; Street et al. 1999) were consulted (see Table 1 for the number of disclosure items examined for each standard).

The next phase was to apply this scoring sheet to each company to determine the extent of compliance by each company within each country. The approach employed in this analysis does not discriminate between the relative importance of different disclosure items. As such, we adopt a dichotomous procedure rather than a weighted scoring scheme,⁷ following prior research (see Buzby, 1974b; Spero, 1979; Robbins and Austin, 1986; Wallace, 1988; Cooke, 1989a; Ahmed and Nicholls, 1994; Hossain et al., 1994; and Haniffa and Cooke, 2002). An item is assigned a value of one if it is disclosed and zero, otherwise (Cooke, 1989a). Under this approach, the consideration is whether or not firms disclose items of information in their corporate annual reports. However, one major problem with this type of scoring system is that some companies might be penalised by being

assigned a score of zero when the company is not expected to disclose that item because it is irrelevant due to the nature of operations or some other reasons. In order to mitigate this problem, we read the whole annual report first to understand the nature and complexity of each company's operations, and to determine whether a particular item was required to be disclosed or not (Cooke, 1989a). We also organised meetings among the investigators during the scoring process to determine relevant items that were identified and to ensure that the scoring was undertaken consistently.

We used a relative scoring approach in which the total compliance index (TCI) of a firm is assessed as the ratio of the computed total disclosure score (TD) to the total expected number of items required to be disclosed by the firm (M). The disclosure index for compliance (TCI) for each company is then expressed as a percentage. Nonetheless, the issue of discriminating between non-disclosed and non-applicable items is a relevant consideration. In calculating the total compliance index (TCI) for this analysis, we decided to remove non-applicable items from the total expected number of disclosure items for each company, thus, giving a compliance score calculated relative to all items expected to be disclosed by companies. This was considered to be a fairer and more accurate measure, as opposed to treating each sample company as being identical and all having comparable disclosure requirements. This second approach would result in overall lower total compliance scores for companies, as

⁴ According to Hossain and Islam (2002) "..... However, the ICAB did not make any attempt to modify these accounting standards taking into consideration the local laws and regulations. The ICAB always claim and demand the credit for just wholesale adoption of IAS and the national standards".

⁵ We are thankful to the Institutes of Chartered Accountants in India, Pakistan and Bangladesh for providing us with necessary documents relating to national accounting standards which helped us in developing the scoring sheet.

⁶ A complete list of the items and company scores are available from the authors.

⁷ The reason for assigning weights is to distinguish between more important items and less important items. However, weighting may introduce two potential problems, namely that the importance of disclosure items may vary from one user to another and it also may vary among firms as well as at an industry level. Libby (1981, pp. 40-43) noted that the revealed perceptions of respondents to an opinion survey do not often represent what the respondents actually do, it is possible to argue that this weight derived from opinion pools may not mirror reality (Wallace and Naser, 1995, p. 331). Further, attaching weight to the importance of different items of information does not usually affect real economic consequences for the subjects whose opinions were pooled (Chow and Wong-Boren, 1987, p. 536), nor do they reflect stable perception on similar items of information across subjects, over time (Dhaliwal, 1980, p. 386) and from similar subjects across countries (Firer and Meth, 1986, p. 178). In addition, empirical results (Spero, 1979, pp. 42-64; Robbins and Austin, 1986, pp. 417-420; Chow and Wong-Boren, 1987, pp. 536-538) have suggested that weighted and unweighted disclosure indexes produce similar results.

all non-applicable items would be treated as instances of non-disclosure.

Archer et al., (1995), Morris and Parker (1998) and Pierce and Weetman (2002) have put forward adjustments to harmonisation and comparability measures, such as the I and C indices developed by van der Tas (1988) and Archer and McLeay (1995), in situations of non-disclosure. Our total compliance index (TCI) is not, however, a harmonisation measure and it would not be correct (or possible) to apply a similar adjustment process. Indeed, it is possible for two companies to have identical total compliance index (TCI) scores, yet demonstrate a low level of disclosure harmony, irrespective of the magnitude of non-disclosure or non-applicable items. We acknowledge, however, that the subjective discrimination between non-applicable and non-disclosed items is a potential limitation in the interpretation of the paper's findings.

4. Corporate attributes affecting national accounting standard disclosure compliance

Prior literature on determinants of information disclosure of mandatory items suggests that the extent of disclosure compliance varies across companies and that corporate attributes are associated with such variation (Ahmed and Nicholls, 1994; Wallace and Naser, 1995; Dumontier and Raffournier, 1998; and Owusu-Ansah, 1998). Based on these we have selected five corporate attributes that affect the variation in disclosure compliance levels with national accounting standards. The reasons for selection of these attributes are as follows.

4.1. Size of the Reporting Entity (LTASS)

Several reasons have been advanced in the literature in support of an a priori expectation that the level of disclosure is positively associated with the size of the firm. First, the accumulation and dissemination of information is costly, hence, it is more likely that large companies have the resources and expertise to provide more information in their annual reports which causes less non-disclosure compliance. Second, Buzby (1975) argued that larger firms usually make many products and distribute them over large geographical areas, which requires a relatively large volume of internal data in order to keep the companies informed about their operations. This means the marginal cost of accumulating and disseminating is small, therefore, the overall cost of compliance and disclosure of large firms is lower for these firms compared to smaller firms. Third, it has been established that the cost of capital reduces with increased disclosure (Botosan, 1997; Sengupta, 1998) and, since larger firms utilise far more external finance from the stock market for their operating and investment activities than their smaller

counterparts, it is expected that they would find it beneficial to disclose more and comply with relevant regulations. A fourth reason is that smaller firms may feel that their information disclosure could endanger their competitive position in relation to larger firms in their industry (Buzby, 1975). Therefore, smaller firms may tend to disclose less information in their annual reports than large firms. Finally, Firth (1979), Barry and Brown (1986) and Schipper (1991) argue that the annual reports of large firms are more likely to be scrutinised by financial analysts and government agencies than those of smaller firms. As a result, non-disclosure may be interpreted by investors as 'bad news' which could adversely affect the firm's value. Further, larger firms have greater incentives to disclose more financial information in their annual reports than smaller firms to enhance their reputation and public image and to lessen public criticism, government intervention and agency costs (Watts and Zimmerman, 1986; Chow and Wong-Boren, 1987).

Prior studies have overwhelmingly found that firm size is associated with disclosure volume, both voluntary and mandatory, in the corporate annual reports (see Singhvi and Desai, 1971; Buzby, 1974a; McNally et al., 1982; Chow and Wong-Boren, 1987; Cooke, 1989b, 1992; Wallace et al., 1994; Ahmed and Nicholls, 1994; Hossain et al., 1994; Raffournier, 1995; Wallace and Naser, 1995; Inchausti, 1997; and Hossain, 1999).

4.2. Financial Leverage (FINLEV)

External finance creates an opportunity for shareholders to transfer wealth to the prejudice of creditors that increases agency costs between shareholders and creditors and the riskiness of the firm. Firms with high debt tend to disclose more information to assure creditors that shareholders and management are less likely to bypass their covenant claims (Myers, 1977; Schipper, 1981 in Haniffa and Cooke, 2002). Further, Dumontier and Raffournier (1998) argue that increased disclosure by way of complying with IAS disclosure requirements improves the monitoring role of financial statements that, in turn, reduces agency conflicts and the scope for earnings manipulations. Concerning South Asia, commercial banks and specialised financial institutions play an important role in corporate finance. Firms are required to submit audited annual reports for inspection prior to loan approval, as well as on a regular basis during the loan term. As such, firms seeking debt finance in South Asia face minimum disclosure requirements. On the other hand, public equity subscription invites more stringent disclosure and firms taking this option are likely to disclose more detailed financial information. This suggests that there may be a negative relationship between the

leverage position of firms and disclosure compliance in South Asia.

Prior studies report mixed findings regarding the association between leverage and the level of disclosure. Bradbury (1992) and Low (1998) both identified a positive association between information disclosure and leverage; however Chow and Wong-Boren (1987), Craswell and Taylor (1992), Ahmed and Nicholls (1994), Hossain et al., (1994), Wallace et al., (1994), Wallace and Naser (1995) and Inchausti (1997) find no such statistical association. Belkaoui and Kahl (1978) found that the leverage ratio was negatively associated with the disclosure index. Also, Hossain (1999) argued that firms with higher debt-ratios might disclose less information in their annual report in order to disguise the level of the firm's risk.

Prior research has used a number of measures of leverage including debt to total assets, total debt and debt to equity ratios. The present study uses the total debt to total tangible assets ratio as the measure of leverage.

4.3. Multinational Company Influence (MCI)

The present industrial scenario is dominated by multinational corporations and there are several multinational corporations operating in South Asia. These corporations, apart from selling products abroad, also set up production facilities in the host countries to avail themselves of business and investment opportunities offered to them. Saudagaran and Biddle (1992) observed that multinationals are usually multiple listed and need to meet the information requirements of a diverse group of investors with different cultural backgrounds, resulting from the internationalisation of business and capital markets. Jaggi and Low (2000) argue that detailed and comprehensive information is needed by investors who have investments at home and abroad. They argue that the political costs of multinational subsidiaries are more than that of their local counterparts in emerging countries. This is due to the political pressure groups keeping a close eye on subsidiaries of multinational companies and regarding them as a source of exploitation. Moreover, subsidiaries of multinational companies may be viewed as significant entities in the economies of developing countries and they may operate under the threat of government control or expropriation. In order to reduce this political risk, Ahmed and Nicholls (1994) and Craig and Diga (2000) suggest that multinationals operating in emerging countries are expected to disclose more information. Further, multinationals are expected to generate more information than their local counterparts in order to comply with the more stringent disclosure regulations of their parent companies which are mostly in western developed countries. Meek and Gray

(1989) also argued that multinational companies usually disclose more specific information in their annual reports, although they operate outside their country of origin. As such, a different level of disclosure between foreign-owned and locally-owned companies may arise.

Prior studies have found evidence of higher disclosure level and compliance by multinational corporations in emerging countries and newly-industrialised countries (see Ahmed and Nicholls, 1994; Owusu-Ansah, 1998; Craig and Diga, 2000).

We use a dichotomous variable in which we assigned a value of one if the company is a subsidiary of a multinational corporation and zero otherwise. A sample company is considered as being affiliated with a multinational corporation when the name itself is instantly recognised (such as Lever Brothers) and/or the name and address of the parent company is provided in the annual report. This status was confirmed with information provided in the parent company's annual report, where available. For our company sample, the total number of subsidiary companies operating in India, Pakistan and Bangladesh are 58, 37 and 12 respectively. We accept that this broad categorisation has limitations, since many locally owned large companies have international linkages through export and import or through joint venture arrangements. However, such specific information is not available from public documents such as the annual reports.

4.4. Size of External Auditor (SAF)

Although the primary responsibility for preparing the financial report lies with the company management, the external auditors play a major role in the disclosure policies and practices of their clients. DeAngelo (1981) and Fama and Jensen (1983) suggest that large audit firms have a greater incentive to report a breach in the company's accounting system. If the client issues financial reports with errors and inadequate disclosure, this is likely to diminish the reputation of large audit firms more than small audit firms, which causes large audit firms to be more diligent in certifying client's accounts. Further, because of their large number of clients and lesser dependence on any individual client's fees (deep pocket), they can maintain independence and exert more influence over the company's disclosure policies than that of smaller audit firms. Jensen and Meckling (1978) and Watts and Zimmerman (1986) argue that large auditors exert more of a monitoring role in limiting the opportunistic behaviour by management. They also argue that larger audit firms are less likely to be associated with clients which disclose lower levels of information in their annual reports.

Prior studies (e.g. Singhvi and Desai, 1971;

DeAngelo, 1981; McNally et al., 1982; Beaty, 1989; Ahmed and Nicholls, 1994; Hossain et al., 1994; Raffournier, 1995; and Inchausti, 1997) have found a positive association between the size of the audit firm and the level of disclosure. In contrast, Tan et al., (1990), Malone et al., (1993) and Wallace et al., (1994) identified no significant association between the size of audit firm and the level of disclosure.

Prior studies on emerging countries categorise audit firms on the basis of whether an auditor belongs to a Big Five international audit firm or not (Hossain, at al., 1994; Owusu-Ansah, 1998; and Haniffa and Cooke, 2002). However, such dichotomous classification is very difficult to apply for empirical purposes to Indian, Pakistani and Bangladeshi companies. This is due to the situation of Big Five international accounting firms not being well represented in South Asian countries, especially in Pakistan and Bangladesh. However, representatives of several international audit firms exist in Pakistan and Bangladesh. Local audit firms are selected on the basis of their domestic reputation, the training and experience of senior audit personnel, and the quality of audit services.

Because of the problem associated with solely utilising a big versus small categorisation, and its inherent subjectivity in South Asia, a continuous variable is constructed and employed. The variable is the factor score consisting of audit fees (AUD-FEE), audit market concentration, as measured by the number of entities audited by a firm (NUM-FIRM), and a dummy variable of small (zero) or large (one) based on international linkage (branch office of a Big Five accounting firm/linkage via local firm) and local reputation (Ahmed, 2003). Information on audit firm size and local affiliates was obtained from ICAI, ICAP and Karim and Moizer (1996) on India, Pakistan and Bangladesh, respectively. The rationale for selecting audit fees, number of reporting entities audited by an audit firm and size of audit firm can be found in prior studies, such as Francis (1984).

The factor score is obtained from principal component analysis using varimax rotation and directly input into the regression estimation. The factor analysis for the overall sample extracted one factor with an eigenvalue of 1.728 and an explanatory power of about 57.60%. The separate factor analy-

ses for India, Pakistan and Bangladesh also resulted in one factor with an eigenvalue (% of variation) of 2.046 (68.206), 1.870 (62.340) and 1.612 (53.735), respectively. We also used a dichotomous variable, following prior research, to test for robustness of the results.⁸ A positive association is expected between size of the audit firm and compliance level.

4.5. Profitability (ROTA)

Profitability has been identified as an influencing factor on corporate disclosure level, including disclosure compliance (Wallace et al., 1994; Raffournier, 1995; Inchausti, 1997; Owusu-Ansah, 1998; and Street et al., 1999). Inchausti (1997) argues that management of profitable companies may disclose more detailed information in the annual report because they feel comfortable communicating this good news to the stock market in order to improve the firm's valuation. Dumontier and Reffounier (1998) suggest that compliance with IASs by profitable firms may signal their superior performance to the market and reduce incentives for earnings manipulation by management.

Empirical results on this issue are mixed in both emerging and developed countries. While Cerf (1961), Inchausti (1997) and Owusu-Ansah (1998) found a positive association between profitability and the level of disclosure, Belkaoui and Kahl (1978) and Wallace and Naser (1995) identified a negative relationship between these two variables.

Consistent with prior studies, profitability is measured as the percentage of net operating income before extraordinary items to the book value of total assets at the end of the financial year.

5. Data collection and model development

5.1. Data collection

The sample of companies whose national accounting standard disclosure compliance is examined has two characteristics. First, the study covers companies listed on the largest Stock Exchange in each country, namely, the Dhaka Stock Exchange (DSE) in Bangladesh, the Mumbai (Bombay) Stock Exchange (BSE) in India and the Karachi Stock Exchange (KSE) in Pakistan; hence representing companies with the widest spread and diversity of stockholders, and potentially the greatest pressure to exhibit high standards of disclosure (McNally et al., 1982). Second, to ensure that no bias was introduced into the analysis by including companies which, because of their activities, were unable to disclose some of the items in the survey, only those non-financial companies with a primary or significant interest in manufacturing activities were included. Thus, banking, insurance, service, extractive, property and investment and other companies were excluded for data homogeneity

⁸ The audit variable factor score was also calculated using only the two continuous variable components, audit fee and audit market concentration, and excluding the binary international linkage indicator variable. This was done to check for any abnormal effects on the audit factor scores from inclusion of the dummy variable. Without the international linkage dummy, the eigen-values decreased but did not change markedly, and the regression coefficients for the size of audit firm (SAF) factor variable remained relatively unchanged and statistically insignificant. We thank an anonymous reviewer for suggesting this check.

Table 2
Sample size and distribution according to industry

Panel A: Number of sample companies by country

	Bangladesh	India	Pakistan	Total
Annual Reports received	120	239	236	595
Missing information	2	20	7	29
Usable reports	118	219	229	566

Panel B: Distribution of sample according to industry

Industry	Bangladesh (n = 118)	India (n = 219)	Pakistan (n = 229)	Total (n = 566)
1. Auto and allied	2	19	18	39
2. Cable and electrical product	5	16	8	29
3. Chemical and pharmaceutical	21	54	27	102
4. Clay product and refractory	11	14	23	48
5. Engineering	4	40	9	53
6. Food and allied products	20	15	35	70
7. Leather and tanneries	7	10	8	25
8. Paper and board	4	18	5	27
9. Plastic and rubber	9	9	5	23
10. Textile and allied	35	24	91	130

and due to the existence of different legislation governing disclosures by financial institutions.

A list of company names with mailing addresses for 150 companies listed on the DSE, 500 on the BSE and 300 on the KSE was prepared from the websites of the companies and the stock exchange list at the end of 2000. Letters were sent to each company's head office with a request to mail its 1998 corporate annual report.⁹ However, only 40 reports were collected in this way. Consequently, the DSE in Bangladesh, the Research Development Association in India and Paksearch¹⁰ in Pakistan were contacted to obtain annual reports for the year 1998.

In total, 595 company annual reports for the reporting year-end 1998 were collected from these organisations. However, 29 companies were dropped from the analysis due to missing data, leaving 566 companies for use in this study. In regard to corporate reporting dates, the majority of sample companies from India had 31 March, 1998 reporting year ends, whereas June, September and

December year-ends were more common in Pakistan and Bangladesh. National accounting standards in effect at the calendar year-end of 1998 were used to prepare the disclosure item specification list. The national accounting standards in India, Pakistan and Bangladesh were not modified between March and December 1998.

The sample comprises 118 companies from Bangladesh, 219 companies from India and 229 companies from Pakistan, and represents 63.8%, 4.5% and 36.9% of the total listed companies in Bangladesh, India and Pakistan respectively at the end of 1998. Table 2 shows the distribution of sample companies according to country origin. Panel B of the table shows that the chemical and pharmaceuticals and textile and allied product sectors have most firms within the sample, but the distribution is well balanced across all manufacturing sub-sectors and across countries.

5.2. Model specification

A multivariate Ordinary Least Squares (OLS) approach is used to determine which firm attributes are associated with national accounting standard compliance and their significance level. As previously stated, the dependent variable is the level of compliance with 14 national accounting standards by sample companies in each country (TCI). Based on the review of disclosure studies, the selected explanatory variables are size of the reporting entity (LTASS), financial leverage (FIN-LEV), whether the firm is affiliated with a multi-national corporation (MCI), size of the reporting entity's audit firm (SAF) and the firm's profitabil-

⁹ There were 185 non-financial listed companies on the DSE, 4,890 on the BSE and 621 on the KSE at the end of 1998, respectively. When the letters were sent around the end of 2000 it was expected that all companies in the list would finalise their 1998 annual reports. Note that several companies do not finalise their financial reports until well after the end of the financial year in South Asia (Ahmed, 2003).

¹⁰ Paksearch is a commercial data-base company that puts scanned images of the annual reports of all listed companies in Pakistan, along with other economic data, on its web page which is accessed through subscription. The web address is www.Paksearch.com. For India and Bangladesh, actual annual reports were purchased.

Table 3
Distribution of total compliance index scores

<i>Score range</i>	<i>Bangladesh</i>		<i>India</i>		<i>Pakistan</i>	
	<i>No. of firms</i>	<i>% in the sample</i>	<i>No. of firms</i>	<i>% in the sample</i>	<i>No. of firms</i>	<i>% in the sample</i>
<i>% of Disclosure index</i>						
50%–60%	5	4.24	1	0.46	2	0.87
60%–70%	19	16.10	21	9.59	6	2.62
70%–80%	40	33.90	99	45.21	73	31.88
80%–90%	45	38.14	92	42.01	120	52.40
Over 90%	9	7.63	6	2.74	28	12.23
Total	118	100.00	219	100.00	229	100.00

ity (ROTA). The model specification is shown below:

$$TCI_i = \alpha + \beta_{11} LTASS_i + \beta_{12} FINLEV_i + \dots \quad (1)$$

Expected sign (+) (+/-)

$$\beta_{13} MC1_i + \beta_{14} SAF_i + \beta_{15} ROTA_i + \varepsilon_i$$

Expected sign (+) (+) (+)

where:

TCI_i = total compliance with national accounting standard disclosure requirements for each company i ;

$LTASS_i$ = \log_{10} of the book value of total assets of the reporting entity at year end for company i ;

$FINLEV_i$ = ratio of total debt to the book value of total tangible assets for company i ;

$MC1_i$ = 1 if company i is a subsidiary of a multinational company, otherwise zero;

SAF_i = a continuous variable (factor score based on three proxies) to represent the size of reporting entity i 's audit firm;

$ROTA_i$ = return on total assets, measured by net operating profit to the book value of total assets for company i .

6. Descriptive statistics and results

Table 3 presents descriptive statistics for the dependent variable, the total compliance index (TCI) scores, for the three countries included in this analysis. The first point of note is that all companies in the three countries were found to have TCI scores of at least 50%, suggesting that companies in Bangladesh, India and Pakistan complied with the majority of national accounting standard disclosure requirements. As shown in Table 3, companies in Pakistan achieved the highest level of overall compliance with national accounting standards, with over 64% of companies having calculated TCI scores of 80% or higher. This compares with approximately 45% of companies in India and Bangladesh achieving this calculated level of

compliance with national standard requirements. Bangladeshi companies are seen to have the lowest degree of compliance, as measured by the TCI scores, with 20% of companies achieving TCI scores of less than 70%, compared to approximately 10% and 3.50% of companies in India and Pakistan respectively. The spread of TCI scores across the sample companies in each of these countries suggests that there is significant evidence of non-compliance with national accounting standard disclosure requirements. This reinforces the usefulness of the following cross-sectional evaluation of the factors influencing the compliance with national accounting standard-required disclosure practices, and particularly the nature of companies with low TCI scores.

Table 4 shows the extent of disclosure compliance with each of the 14 standards in each country. It is shown that the highest level of compliance is with the national standards relating to Inventories at 98% in India and Pakistan and 96% in Bangladesh. For the national standards applicable to Property, Plant and Equipment, the compliance level is also high with the lowest being 91.1% in Bangladesh and the highest being 93.2% in Pakistan. In all these countries, respective Companies Acts, including schedules and securities regulations, require extensive disclosure of information relating to depreciation, fixed assets and inventories in annual company reports.¹¹ Consequently, company legislations have an impact on the high level of compliance.

The table shows that the compliance level for

¹¹ In India, comprehensive provisions governing accounts and financial reports are contained in sections 209 to 220 and information to be disclosed in the Sixth Schedule of the Companies Act, 1956. In Pakistan, sections 230 to 247 and the Fourth Schedule of the Companies Ordinance, 1984 and in Bangladesh, sections 181 to 221 and the Eleventh Schedule of the Companies Act, 1994 deal with keeping of accounts, verification of accounts and disclosure of balance sheet and income statement items.

Table 4

The extent of disclosure compliance with 14 national accounting standards in Bangladesh, India and Pakistan

<i>Present accounting standard</i>	<i>Bangladesh</i>	<i>India</i>	<i>Pakistan</i>
1 Inventories	0.958	0.979	0.984
2 Cash flow statements	0.740	0.675	0.763
3 Net profit or loss for the period, fundamental errors and changes in accounting policies	0.790	0.854	0.878
4 Research and development costs	0.782	0.935	0.880
5 Accounting for taxes on income	0.711	0.808	0.794
6 Property, plant and equipment	0.911	0.926	0.932
7 Accounting for leases	0.442	0.461	0.527
8 Retirement benefit costs	0.578	0.698	0.748
9 Accounting for government grants and disclosure of government assistance	0.750	0.825	0.882
10 Effect of changes in foreign currency exchange rates	0.752	0.833	0.836
11 Business combinations	0.809	0.824	0.880
12 Borrowing costs	0.602	0.625	0.609
13 Accounting for investment	0.716	0.647	0.681
14 Accounting for investment in associates	0.799	0.814	0.974

Accounting for Leases is very low with a range between 44.2% and 52.7%. This suggests that, on average, more than half of the disclosures required by this standard are not adhered to by the companies. One reason for the low level of disclosure regarding lease transactions is that a majority of companies consider this an off-balance sheet transaction and therefore do not disclose information in the annual report. Also, related to the above discussion, corporate and securities legislations do not place similar focus on leasing transactions and related disclosure requirements. The low level of compliance is also noted for the national standard disclosure requirements relating to Borrowing costs.

Table 5 presents descriptive statistics for the dependent and explanatory variables. For the dependent variable, the average compliance level is 80% for the whole sample, 81% for Pakistan, 79% for India and 78% for Bangladesh. The dispersion, as measured by the standard deviation, indicates that the spread is uniform across the three countries. It is interesting that the compliance index scores for Pakistan are higher, but not statistically different, than those for Indian companies, particularly considering the size disparity between India and Pakistan. We cannot offer a definitive explanation for this observation, with factors such as institutional or regulatory differences likely to be the cause. For instance, more Indian sample companies are subsidiaries of multinational companies than is the case for Pakistan companies, whereas the descriptive statistics for the Pakistan sample suggest that audit firms are larger and are more likely to have international linkages in Pakistan compared to India. Since heteroskedasticity ap-

pears to place more weight on the extreme observations and may lead to inefficient estimates of parameters (Pindyck and Rubinfeld, 1986), Bartlett's tests were applied to test for the homogeneity of variance in the indexes, because the acceptance of national standard disclosure indexes for each company were based on unequal observations. The test results show that the acceptance of national standard disclosure index variances were homogeneous at the 0.05 level.

Table 5 shows that Indian companies are larger in size, as measured by total assets, with an average of Indian Rs. 4.70 m, followed by Pakistan companies with a mean size of Rs. 1.99 m and Bangladeshi companies' size averaging Tk. 0.62 m. The standard deviation of this variable is large across all three countries, and skewness and kurtosis statistics reveal that the size measures are not normally distributed. Therefore, following prior research, the log (base 10) of this variable is taken to handle the non-normal data and used in the regression model. Net income figures show that Indian companies, on average, made about seven times more profit than Bangladeshi companies and about five times more profit than Pakistani companies during the period under study, which is consistent with the pattern of company sizes.

To assess the effect of collinearity among the explanatory variables in multiple regression estimation, Pearson's correlation among continuous variables and Point Biserial correlation between continuous and dummy variables and between two dummy variables were computed for all sample companies and for each country. The results for the whole sample, not presented, indicate that the highest coefficient of correlation was 0.324 be-

Table 5
Descriptive statistics of dependent and explanatory variables according to country and total sample

Variables	Bangladesh <i>n</i> = 118						India <i>n</i> = 219						Pakistan <i>n</i> = 229						Total sample <i>n</i> = 566					
	Mean	Median	St. Dev	Range	Mean	Median	St. Dev	Range	Mean	Median	St. Dev	Range	Mean	Median	St. Dev	Range	Mean	Median	St. Dev	Range	Mean	Median	St. Dev	Range
TCI	77.769	9.239	78.619	6.794	80.704	7.571	79.729	7.741	79.028	44.200	81.667	49.603	79.989	49.603	79.729	7.741	643.649	1028.222	4699.674	12245.008	1918.721	6763.947	2728.916	8900.222
LTASS (000)	262.403	6316.297	1106.917	89475.132	530.757	66797.824	611.344	89501.022																
LTASS	8.450	0.571	8.482	0.998	8.228	0.927	8.372	0.902	8.410	2.890	8.560	5.600	8.440	6.610	8.480	6.730								
INCOME (\$000)	50.002	118.000	358.000	1640.000	75.191	924.000	185.000	1200.000	7.388	9910.000	50.882	21000.000	9.767	17700.000	20.145	26500.000								
FINLEV	0.652	0.655	0.642	0.403	0.764	0.605	0.693	0.550	0.525	3.760	0.600	3.640	0.648	3.560	0.609	3.760								
MCI	0.10	0.30	0.26	0.44	0.19	0.39	0.20	0.40	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00								
SAF++	0.000	0.712	-0.348	0.844	0.438	1.097	0.000	1.000	-0.317	1.967	-0.603	3.392	0.209	3.516	-0.317	5.278								
SAFDUM	0.389	0.489	0.306	0.462	0.594	0.492	0.439	0.497	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000								
ROTA (%)	5.710	16.480	5.250	10.190	3.840	14.290	4.770	13.380	2.000	164.000	5.660	880.00	5.000	178.000	5.000	263.000								

++Factor score of audit fees, number of reporting entities audited by an audit firm and large versus small audit firm.

Table 6
Multiple regression results on disclosure compliance according to country and overall sample

$$TCI = \alpha + \beta_1 LTASS + \beta_2 FINLEV + \beta_3 MCI + \beta_4 SAF + \beta_5 ROTA + \varepsilon$$

<i>Variable</i>	<i>Sign</i>	<i>Bangladesh</i>		<i>India</i>		<i>Pakistan</i>		<i>Total sample</i>	
		<i>Coeff</i>	<i>T-value</i>	<i>Coeff</i>	<i>T-value</i>	<i>Coeff</i>	<i>T-value</i>	<i>Coeff</i>	<i>T-value</i>
LTASS	+	-0.002	0.134	0.025	6.924**	0.042	8.883**	0.026	8.344**
FINLEV	+/-	-0.007	0.737	-0.002	0.304	0.002	0.384	-0.002	0.454
MCI	+	0.142	5.538**	0.069	7.590**	0.023	2.213*	0.058	7.770**
SAF	+	0.009	1.083	-0.001	0.078	0.001	0.927	0.002	0.651
ROTA	+	0.079	1.771	0.023	0.613	0.102	3.232**	0.079	3.637**
Intercept		0.778**		0.553**		0.457**		0.554**	
R ²		29.7%		42.1%		36.8%		27.8%	
Adjusted R ²		26.5%		40.8%		35.4%		27.2%	
Model's F-value		9.45		131.031		25.859		43.150	
Model's sig level		0.000		0.000		0.000		0.000	

Note: TCI is total compliance index based on national accounting standard disclosure requirements; LTASS is \log_{10} of the book value of total assets of the reporting entity at year end; FINLEV is the ratio of total debt to the book value of total tangible assets; MCI is 1 if the company is a subsidiary of a multinational company, otherwise zero; SAF is a continuous variable (factor score based on three proxies) to represent the size of the reporting entity's audit firm; ROTA is return on total assets.

tween MCI and continuous SAF, followed by -0.274 between ROTA and FINLEV. For individual countries, for Bangladesh the highest correlation is 0.327 between LTASS and SAF, followed by coefficient correlations of 0.314 between MCI and SAF. For India the highest correlation coefficient is 0.411 between SAF and MCI, followed by MCI and LTASS at 0.207. The highest coefficient of correlation is -0.427 between ROTA and FINLEV and the second highest correlation coefficient is 0.196 between LTASS and MCI in Pakistan. Overall, there is a concern that the somewhat high level of correlation might affect the regression estimation results. To identify whether this has been the case, VIF was calculated for variables in each of the regression models. The highest VIF calculated was 1.229 for SAF in Bangladesh, 1.283 for MCI in India, 1.307 for FINLEV in Pakistan, and 1.150 for MCI for the overall sample, suggesting that this is not the case.¹²

Table 6 presents multiple regression results for the total compliance index (TCI) to estimate the coefficients on the explanatory variables for Bangladesh, India, Pakistan and the total sample. The results show that MCI is statistically significant across all countries and for the overall sample at the 1% level. This implies that disclosure compliance is significantly higher for a company

which is a subsidiary of a multinational corporation. This result is consistent with Ahmed and Nicholls (1994) and Owusu-Ansah (1998). The table also shows that the size of the reporting entity is significantly associated with disclosure compliance at the 1% level in India and Pakistan, suggesting that large firms more strongly comply with national accounting standard disclosure requirements in these countries. SAF is not significant for any country and the overall sample, indicating that large audit firms have no impact on disclosure compliance. This result somewhat contradicts Ahmed and Nicholls (1994), who found that disclosure compliance was higher for a reporting entity whose accounts were audited by large local firms in Bangladesh. Three important reasons for this anomaly can be put forward. First, the time gap between the two studies is 10 years (1987-88 versus 1997-98). Second, many local firms have developed linkages with internationally reputed audit firms over the years and, third, Ahmed and Nicholls (1994) examined disclosure compliance with the Companies Act and Securities and Exchange Rules in Bangladesh, whilst this study examines disclosure compliance with national accounting standards adopted by the professional bodies in Bangladesh. However, the finding is consistent with Owusu-Ansah (1998), who found no significant association between audit quality and disclosure compliance in Zimbabwe.

FINLEV is not significant in any country nor is it significant in the overall sample. The t-values are too small to be meaningful. Leverage was also not statistically significant in Ahmed and Nicholls

¹² VIF is equal to $1/(1-R^2)$, where R^2 is derived from the multiple regression of an explanatory variable on all other explanatory variables (Gunst and Mason, 1980, p. 295). The SPSS statistical package automatically calculates VIF on command.

Table 7
Multiple regression results on disclosure compliance using audit firm dummy

$$TCI = \alpha + \beta_1 LTASS + \beta_2 FINLEV + \beta_3 MCI + \beta_4 SAFDUM + \beta_5 ROTA + \epsilon$$

Variable	Sign	Bangladesh		India		Pakistan		Total sample	
		Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value
LTASS	+	-0.002	0.130	0.025	6.904**	0.042	8.831**	0.026	8.344**
FINLEV	+/-	-0.006	0.884	-0.002	0.309	0.002	0.389	-0.002	0.544
MCI	+	0.143	5.770**	0.068	7.748**	0.023	2.216*	0.056	7.744**
SAF	+	0.022	1.366	-0.001	0.121	0.001	0.130	0.002	2.376**
ROTA	+	0.086	1.910	0.023	0.620	0.102	3.237**	0.079	3.637**
Intercept		0.769**		0.553**		0.457**		0.550**	
R ²		30.1%		42.1%		36.8%		28.5%	
Adjusted R ²		27.0%		40.8%		35.4%		27.9%	
Model's F-value		9.646		31.031		25.864		44.596	
Model's sig level		0.000		0.000		0.000		0.000	

Note: TCI is total compliance index based on national accounting standard disclosure requirements; LTASS is \log_{10} of the book value of total assets of the reporting entity at year end; FINLEV is the ratio of total debt to the book value of total tangible assets; MCI is 1 if the company is a subsidiary of a multinational company, otherwise zero; SAFDUM is a dichotomous variable to represent the size of the reporting entity's audit firm (large 1, otherwise 0); and ROTA is return on total assets.

(1994). With respect to profitability (ROTA), it is significant ($p<0.01$) for Pakistani firms only. The overall sample is also significant ($p<0.01$), which is likely to be driven by the Pakistan company sample. The model is significant ($p<0.01$) across all countries and the overall sample. The adjusted R² is reasonable and is consistent with prior compliance studies.

We repeat the foregoing multivariate analyses using the ranked regression procedure (results not shown, but are available from the authors on request). Lang and Lundholm (1993) and Wallace et al., (1994) have suggested the use of ranked regression as a powerful alternative estimation model for coping with data sets with skewed distributions and when there is a potential for non-linear and monotonic relations between the dependent and explanatory variables. Ranked regression requires all continuous variables to be ranked either in ascending or descending order and regression of the ranked endogenous variable on the ranked (continuous) and unranked (dichotomous) exogenous variables. The results are very consistent with those reported above. We find that multinational company influence is significant ($p<0.01$) and firm size is statistically significant for India and Pakistan ($p<0.01$). The only departure is that profitability (measured by ROTA) in

Bangladesh is also significant. The models remained significant ($p<0.01$) for all countries and for the total sample.

Because we used a continuous factor score to proxy for audit firm size, we re-estimated the model using the conventional dichotomous variable to determine whether the above findings would change. When the variable (SAFDUM) is incorporated into the model, the results remain very much the same as those presented in Table 6. The SAFDUM variable is statistically significant for the overall sample, but not for any of the individual countries. MCI and LTASS remain as the two significant variables in the model for each country and the overall sample.

Conventional diagnostic tests were undertaken to test for the normality of residuals for each model. Plots of residuals against the predicted values and Wald statistics¹³ do not suggest any departure from normality, since none of the statistics are found to be significant at the conventional 5% level.

Like all empirical studies, this study may suffer from model specification and omitted variable problems. This study developed a recursive regression model where there might be interdependency (endogeneity) between disclosure compliance level and some of the explanatory variables such as firm size and profitability, in which case a simultaneous equations approach would be suitable. However, the theory and literature is not developed yet to apply such as a model. The omitted variables are international listing status, export orientation, audit opinion and proxies for firm specif-

¹³ See Greene (1991, p. 329) for further details. The statistic is calculated as follows: $W=n[b^1/6+(b^2-3)^2/24]$, where b¹ is skewness, b² is kurtosis and n is the number of observations. W is asymptotically distributed as chi-squared with two degrees of freedom.

ic corporate governance structure such as directors' qualification and experience, ownership dispersion, and corporate specific cultural values. However, in South Asia such information is not readily available to operationalise. Further, the sample selection is not random and does not represent a balanced proportion of companies listed on each national stock exchange. However, compared with prior studies, the number of firms examined in this study is substantially greater.

7. Conclusions

This paper has examined the level of compliance with disclosure requirements mandated by fourteen national accounting standards for a large sample of companies within the three major countries within South Asia, namely India, Pakistan and Bangladesh, and evaluated the factors which determine the degree of reporting compliance with these standards. This has inherent usefulness, particularly in examining the accounting environment in South Asia and the progress of efforts towards improving accounting disclosure practices within this region, and also in identifying factors that are important in determining compliance levels in these countries.

A primary component of this analysis was the development of a total compliance index (TCI) for each sample company, which provides a percentage score of the degree of compliance with national accounting disclosure requirements. Examination of the distribution of TCI scores for the individual companies, and country groupings, suggested the existence of significant non-compliance with mandated requirements, with companies from Pakistan having the highest level of overall compliance, whereas slightly lower compliance levels are documented for India and Bangladesh.

There is also evidence suggesting that compliance levels and TCI scores vary significantly across the 14 national accounting standards examined, with systematic trends observed across the three South Asian countries. It has been found that disclosure compliance is higher for standards regarding depreciation, inventories, and property, plant and equipment. We believe that this higher level of compliance is due to detailed disclosure requirements embedded in the Companies Act within each country. The low level of compliance with accounting for leases and accounting for business combinations is a concern and the regulators within each country should take necessary steps, such as more dissemination of information among the preparers and auditors, with a view to improving the situation.

The regression estimation results suggest that compliance levels (as measured by sample companies' TCI scores) are significantly positively related to company size and profitability performance.

Multinational companies, or sample companies which are subsidiaries of multinational companies, also have significantly higher compliance levels than domestically owned and operated companies. These findings hold for the overall company sample and for individual country sub-samples, and after applying both OLS and ranked regression methodologies and various definitions of audit firm quality. The magnitude of leverage employed and the size of external auditors do not appear to have a significant influence on disclosure compliance levels in any of the countries examined.

The regression results have implications for disclosure compliance. The disclosure index developed for this study can be utilised by preparers in assessing the extent of compliance by their companies. The index can be up-dated by adding new standards and would help provide a bench-mark for researchers or practitioners undertaking future compliance analysis or evaluation. In doing so, they may utilise the compliance level of large firms and firms which have linkages with multinational firms for bench-marking purposes.

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Audit pricing following mergers of accounting practices: evidence from Hong Kong

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Abstract—This study investigates what happens to audit fees after audit firms merge. In particular, we examine whether pre-merger fee premiums of the strong brand name auditor spread to the other auditor. Using data from Hong Kong we analyse the 1997 merger between Kwan Wong Tan & Fong (KWTF) and Deloitte Touche & Tohmatsu (DTT) to become DTT, and the 1998 merger between Coopers & Lybrand (CL) and Price Waterhouse (PW) to form PricewaterhouseCoopers (PwC). We find that DTT audit fees are 55% higher than KWTF prior to the merger and this premium falls to 41% in 1998 and to 34% in 1999. However, we find no increase in audit fees for incumbent property company clients, a sector where KWTF is the leading supplier. Prior to its merger, PW earned audit fees 16.4% higher than those earned by CL and the premium is even larger for clients in the consolidated enterprises and property companies sectors. We find no change in audit fees after the PwC merger. This result suggests that the PwC merger is a response to increased competition and clients are unwilling to pay higher fees for within-Big 5 re-branding.

1. Introduction

Audit pricing has been a major area of research for more than 20 years. Empirical studies have been conducted in many countries and across a variety of settings (Brinn et al., 1994; Cullinan, 1997; Beattie et al., 2001; Clatworthy et al., 2002). Common findings include a strong positive association between audit fees and client size, risk, and audit complexity (for examples, see Simunic, 1980; Simon and Francis, 1988; Chan et al., 1993; Pong and Whittington, 1994; Craswell et al., 1995; Ezzamel et al., 1996; Gregory and Collier, 1996). Many studies have also concluded that some audit firms earn higher fees than others although the exact source of these premiums has proven to be controversial. In a general sense, audit firms that receive fee premiums are assumed to have established a reputation for providing superior quality services along some dimension(s); that is, they differentiate themselves from other audit firms on the basis of quality.¹

There have also been a number of audit firm mergers during the past two decades and this has

resulted in an increased supplier concentration (Pong, 1999; Sullivan, 2002). To date, however, there have been few attempts to examine what happens to audit fees when two audit firms merge. To the extent that some firms earn higher fees than others after controlling for client-specific characteristics, it is natural to investigate if these premiums persist after a merger. For example, does a non-premium fee earner become a premium fee earner after merging with a premium fee earner? An affirmative answer to this question might suggest that the non-premium fee earner has changed its mode of operations to become a quality-differentiated auditor. Our study sets out to address this issue by examining two mergers of audit firms in Hong Kong.

Starting with Simunic (1980) there has been much debate on whether some auditors earn premium fees and what the source of the premium is (Thornton and Moore, 1993). By appealing to the economic theory of quality differentiation, higher fees (to some auditors) are consistent with a quality premium and represent a return to an auditor's costly investment in quality. Thus, once an audit firm has established a reputation for high quality services it will be able to earn premium fees. At the empirical level, many studies conclude that the Big 5 auditors earn higher fees and this is attrib-

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¹ DeAngelo (1981) defines audit quality as the probability that a given auditor will discover and report material misstatements in financial statements. High quality implies the ability to detect errors (competence) as well as the independence to report the errors.

uted to a Big 5 quality differential (Chan et al., 1993; Lee, 1996).²

Some researchers argue that there are premiums for industry specialisation (Craswell et al., 1995; Cullinan, 1997; DeFond et al., 2000). Here, auditors specialise in specific industry sectors and this expertise earns higher fees from clients in those industries. Industry specialism is said to explain differences in audit fees among the Big 5 firms and across Big 5 and non-Big 5 firms. This specialism may be region- or city-specific; that is, an audit firm may be a specialist in an industry in one region or city, but not in another. However, recent studies dispute the specialism argument (Ferguson and Stokes, 2002; McMeeking et al., 2003a) and point out the difficulty in identifying specialists (Krishnan, 2001; McMeeking et al., 2003a).³ Because of the controversy surrounding the specialism argument we do not attribute any premium we find to industry specialism.

Simunic and Stein (1996) argue that an auditor's cost function has a resource component and a liability loss component and it is reasonable to assume that for a given audit, the liability loss function facing a Big 5 firm would be above (i.e., expected losses are greater at any level of effort) that of a non-Big 5 firm. Moreover, Big 5 firms are viewed as having deeper pockets with which to settle any civil lawsuits and on this basis they are more likely to be sued (McMeeking et al., 2003a). Based on the work of Simunic and Stein (1996), we expect an upward shift in an auditor's cost function when it merges to become a Big 5 firm. Unfortunately we cannot directly test Simunic and Stein's (1996) argument, as we do not have access to auditor cost functions and cost data. We do, however, have access to data on audit fees as this is a required disclosure in Hong Kong under the

Hong Kong Companies Ordinance. To the extent that output prices are a function of product costs, our analyses can indirectly test whether there is a change in an auditor's cost function when the auditor changes its quality type and therefore its reputation.

We investigate within-firm inter-temporal pricing differences between a pre-merger non-Big 5 firm and its corresponding merged Big 5 firm and between two Big 5 firms. The mergers we examine are between Kwan Wong Tan & Fong (KWTF), a large local firm, with Deloitte Touche Tohmatsu (DTT) to become DTT in 1997 and the 1998 merger of Coopers & Lybrand (CL) and Price Waterhouse (PW) to form PricewaterhouseCoopers (PwC). Although CL and PW are both Big 5 firms,⁴ PW has a market share of audit fees that is three times higher than CL. PW therefore has much more visibility in Hong Kong, vis-à-vis CL, and this may have an effect on their relative reputations and standings in the city.

As a one-city based audit market that is free of any city-to-city variations, Hong Kong provides a controlled environment to examine reputation effects and is a better setting to test the association between audit fees and an audit firm's quality in terms of brand name reputation. Francis et al. (1999) contend that accounting firm reputations are city-specific and related to the clienteles of individual offices. Thus, a city-based study, such as ours, is a more natural environment to investigate reputation effects. To preface our results, DTT earned premium fees compared to KWTF prior to the merger and PW earned premium fees compared to CL.⁵ Thus we have two situations where fee differences exist prior to the merger. In one case the fee difference is between a Big 5 firm and a non-Big 5 firm, and in the second case there is a fee difference between two Big 5 firms.

Auditor mergers have the potential to reduce competition and raise prices or, alternatively, create efficiencies that reduce prices and increase consumer welfare. Using US data, Sullivan (2002) concludes that the 1989 mergers that reduced the Big 8 to Big 6⁶ do not result in any permanent across-the-board auditor efficiencies or in any anti-competitive unilateral price increases.⁷ International evidence on whether accounting firm mergers dramatically increase concentration is mixed (Iyer and Iyer, 1996; Goddard, 1998; Thavapalan et al., 2002).

Given the increased supplier concentration of audit services in recent years it has become important to assess the impact on audit fees as this can signal audit quality. Our study addresses this issue and contributes to the literature by evaluating what happens to audit fees after two recent audit firm mergers in Hong Kong. We find higher post-merger fees for clients audited by an audit firm that is

² In a different context, Lennox (1999) concludes that Big 5 (or Big 6 in his case) auditors are of higher quality. He found that Big 6 auditors issue reports that are more accurate in predicting financial distress in the UK.

³ Krishnan (2001) points out that there are different ways to measure industry specialisation and they lead to different categorisations of audit firms in the US. She reached no conclusion on whether there is a best measure.

⁴ Prior to the merger between CL and PW in 1998 to become PwC, there were six large international firms. Terminologically, it is two Big 6 firms merging to become a Big 5. For ease of exposition, these firms, both before and after the merger, are referred to as Big 5 auditors in this paper. The Big 5 became the Big 4, after the collapse of Arthur Andersen in 2002.

⁵ Similar evidence was reported by DeFond et al. (2000) who used data from 1992.

⁶ In that year, Ernst & Whinney and Arthur Young merged to become EY. Also, Deloitte Haskins & Sells (DHS) and Touche Ross (TR) merged to become Deloitte & Touche internationally while DHS, TR, and Tohmatsu merged to become DTT in the Asia-Pacific region.

⁷ Sullivan (2002) also argues that the mergers reduce Big 6 marginal costs in auditing large clients.

not a Big 5 prior to the merger but becomes one thereafter.⁸ We also examine whether the premium enjoyed by one Big 5 firm over another Big 5 firm dissipates after their merger. Our results show that the fee difference persists after the merger.

2. Research method and data

We base our cross-sectional audit fee regression analyses on models developed in prior research in Australia (Craswell et al., 1995), Britain (Chan et al., 1993; Ezzamel et al., 1996), and Hong Kong (DeFond et al., 2000).⁹ These models, and others (e.g. Simunic, 1980; Simon and Francis, 1988; Pong and Whittington, 1994; Gregory and Collier, 1996; McMeeking et al., 2003a; Peel and Roberts, 2003), have demonstrated relatively high explanatory power and have been robust across different samples, time periods, and countries, and to sensitivity analysis for model misspecification. Although Pong and Whittington (1994) argue that many audit fee models used in prior research are mis-specified, this seems to have had relatively little impact on the explanatory power and predictive power of the models.¹⁰ Nevertheless we conduct a battery of sensitivity tests to check the robustness of our results. To test for differential audit pricing, experimental variables are added to the audit fee model to specify different groups of auditors.¹¹ The OLS regression model is specified as follows:

$$\text{LAF} = \beta_0 + \beta_1 \text{LTA} + \beta_2 \text{SUBS} + \beta_3 \text{CATA} + \\ \beta_4 \text{QUICK} + \beta_5 \text{DE} + \beta_6 \text{ROI} + \\ \beta_7 \text{FOREIGN} + \beta_8 \text{YE} + \beta_9 \text{LOSS} + \\ \beta_{10} \text{QAR} + \beta_{11} \text{AUDITOR} + \epsilon$$

where:

LAF	= natural log of audit fees;
LTA	= natural log of total assets;
SUBS	= square root of the number of subsidiaries;
CATA	= current assets divided by total assets;
QUICK	= current assets (minus inventories) divided by current liabilities;
DE	= long-term debt divided by total assets;
ROI	= earnings before interest and taxes divided by total assets;
FOREIGN	= proportion of subsidiaries that are incorporated outside Hong Kong;
YE	= dummy variable (1 = non-March 31 fiscal year end);
LOSS	= dummy variable (1 = loss reported in current or prior three years);
QAR	= dummy variable (1 = qualified audit opinion in current year);
AUDITOR	= experimental variable (1 = Big 5 auditor or other auditor grouping, depending on the test); and,
ϵ	= error term, assumed to have the normal OLS regression properties.

LTA is a measure of the size of the client and we expect a positive coefficient as bigger companies have more transactions, assets, and liabilities that need to be audited (Simunic, 1980).¹² A client with many subsidiaries (SUBS) will need more audit effort as the auditor has to deal with many and varied accounting systems and organisation structures, and deal with complex consolidations. We therefore predict a positive sign on SUBS. Inspection of the data indicates non-linearities in the size variables and so, in common with most research studies, we transform audit fees and total assets using a logarithmic function. Further, we transform number of subsidiaries by a square-root function. As current assets tend to have more transactions than other assets, and are more difficult to value, we expect a positive relationship between CATA and audit fees. A company with a low quick ratio may be perceived as being more risky and so the auditor will spend more effort on the audit. This leads to higher fees and thus a negative relation with QUICK. Higher debt ratios (DE) imply greater client risk and this is hypothesised to lead to higher fees either as a reimbursement for the increased audit effort or as an 'insurance' premium (Chan et al., 1993:769).

Clients with low profitability face financial difficulties and in these circumstances the auditor will increase audit effort. We therefore expect a negative sign on ROI and a positive sign on LOSS. Clients with subsidiaries located outside of Hong Kong are more costly to audit because of travel expenses and because of the complexities involved in understanding foreign operations. A positive sign is therefore predicted on FOREIGN.

During the busy audit season, auditors may charge higher fees to clients to compensate for overtime payments to their staff. In Hong Kong, 31 March is the most common fiscal year end and the period thereafter represents the busy period for

⁸ In a different setting, Firth (1993) also concludes that audit fees increase when an audit firm changes its name to that of a Big 8.

⁹ Note we do not include an auditor switch variable in our model because there are very few cases of auditor switches in the sample we use. Previous studies (e.g., Pong and Whittington, 1994; Gregory and Collier, 1996) have found that auditor switches affect audit fees and lead to 'towballing'.

¹⁰ However, using British data, McMeeking et al. (2003a:1) conclude 'when allowance is made for interactions between client size, risk and non-audit services the Big Six premium disappears'.

¹¹ The formal test determines if there is a significant intercept shift in the fitted regression model for different groups of auditors. See Simon and Francis (1988) for the procedure to derive the impact of the intercept shift on the dependent variable, which is the natural log of audit fees.

¹² Sales turnover is another measure of size but we find its statistical fit with audit fees is poorer than when using assets. See Pong and Whittington (1994:1,093) for similar evidence from Britain.

Table 1
1996 auditor market share of Hong Kong-listed companies

	<i>Audit fees \$'000</i>	<i>%</i>
<i>Non-financial companies</i>		
Deloitte Touche Tohmatsu	192,915	21.7
Ernst & Young	185,254	20.8
Price Waterhouse	181,262	20.4
KPMG Peat Marwick	128,298	14.5
Kwan Wong Tan & Fong	85,802	9.6
Coopers & Lybrand	60,836	6.8
Arthur Andersen	19,868	2.2
All others	35,960	4.0
	890,195	100.0
<i>Property companies</i>		
Kwan Wong Tan & Fong	40,859	20.6
KPMG Peat Marwick	38,900	19.6
Price Waterhouse	36,590	18.4
Deloitte Touche Tohmatsu	35,850	18.1
Ernst & Young	31,774	16.0
Coopers & Lybrand	12,300	6.2
Arthur Andersen	2,226	1.1
	198,499	100.0
<i>Consolidated enterprises</i>		
Price Waterhouse	109,503	32.7
Ernst & Young	60,955	18.2
Deloitte Touche Tohmatsu	57,964	17.3
KPMG Peat Marwick	40,100	12.0
Coopers & Lybrand	26,267	7.9
Kwan Wong Tan & Fong	21,627	6.5
Arthur Andersen	7,100	2.1
All others	10,980	3.3
	334,496	100.0

auditors. This implies a negative sign on YE. Companies that receive a qualified audit report have typically received more audit effort as the auditor and client attempt, unsuccessfully as it happens, to reconcile their conflicting stances and remove uncertainties. We therefore expect a positive sign on QAR.¹³ AUDITOR is the experimental variable of interest and it takes on different forms depending on the test. The specific AUDITOR variables (DTT, POST, POST x DTT, PW, and POST x PW) are described later.

2.1. Sample selection

Sample firms are selected from the population of all non-financial companies listed in Hong Kong. In common with many studies we exclude financial companies because their balance sheets and profit and loss statements are very different from other firms. Data required for this study are extracted from the PACAP database, the SEQUENCER database, or are hand collected from the hard copies of annual reports. Two sets of sample data are used in this study. First, pooled cross-

sectional samples of all KWTF and DTT clients are used to examine post-merger KWTF audit fees. We collect data for the 1993 to 1999 period for this set of analyses. Second, pooled cross-sectional samples of all CL, PW, and PwC clients are used to estimate the post-merger CL audit fees. Data for the 1994 to 2000 period are used for this set of analyses. The two sets of analyses are described in detail later on.

2.2. Market shares prior to mergers

In order to get some perspective of the audit industry prior to the mergers we present in Table 1 auditor market shares of audit fees for all non-financial companies listed on the Stock Exchange of Hong Kong. The data are from 1996, the last year before the merger of DTT and KWTF. It is readily

¹³ As will be shown later (Table 2), the mean values of DE, ROI, and QAR are quite low and so a case can be made for their exclusion from the model. However, to make our model consistent with prior research, we prefer to include these variables. As will be seen, ROI and QAR are also significant in the regressions.

Table 2
Descriptive statistics of non-finance Hong Kong-listed companies

	<i>DTT and KWTF clients (1993 to 1999) n = 1240</i>			<i>PW, CL and PwC clients (1994 to 2001) n = 737</i>		
	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>
LAF	6.94	6.92	0.76	7.18	7.12	0.93
LTA	14.00	13.83	1.45	14.49	14.38	1.54
SUB	4.68	4.47	1.97	4.81	4.58	2.17
CATA	0.45	0.47	0.24	0.40	0.38	0.24
QUICK	1.36	0.94	2.21	1.36	1.00	1.42
DE	0.08	0.04	0.10	0.08	0.04	0.10
ROI	-0.04	0.04	1.14	0.01	0.04	0.37
FOREIGN	0.40	0.38	0.20	0.45	0.45	0.25
YE	0.56	1.00	0.50	0.61	1.00	0.49
LOSS	0.35	0.00	0.48	0.33	0.00	0.47
QAR	0.08	0.00	0.27	0.07	0.00	0.26
<i>Experimental variables</i>						
POST - 1997 and after	0.44	0.00	0.50			
DTT	0.68	1.00	0.47			
POST - 1998 and after				0.46	0.00	0.50
PW				0.58	1.00	0.49
LAF	= natural log of audit fees;					
LTA	= natural log of total assets;					
SUBS	= square root of the number of subsidiaries;					
CATA	= current assets divided by total assets;					
QUICK	= current assets (minus inventories) divided by current liabilities;					
DE	= long-term debt divided by total assets;					
ROI	= earnings before interest and taxes divided by total assets;					
FOREIGN	= proportion of subsidiaries that are incorporated outside Hong Kong;					
YE	= dummy variable (1 = non-March 31 fiscal year end);					
LOSS	= dummy variable (1 = loss reported in current or prior three years);					
QAR	= dummy variable (1 = qualified audit opinion in current year);					
POST	= post-merger observations;					
DTT	= dummy variable (1 = an incumbent Deloitte Touche Tohmatsu auditee); and					
PW	= dummy variable (1 = an incumbent Price Waterhouse auditee).					

apparent from Table 1 that CL and AA (Arthur Andersen) are by far the smallest of the Big 5 firms based on audit fees. It is also apparent that KWTF is a sizable non-Big 5 firm and has a market share higher than CL and AA. The market shares are similar to those reported by Lee (1996) and DeFond et al. (2000) and this shows inter-temporal stability in the data.

We also tabulate the market share of audit clients in the property companies and consolidated enterprises sectors of the stock market. As shown, the merging parties have different, or distinctive, market shares of the audits of property companies and consolidated enterprises in Hong Kong. In the property companies sector, KWTF has a larger market share than its subsequent merger partner, DTT, and in fact it has the largest market share of any auditor. It is unusual to find a non-Big 5 auditor having the largest market share of listed clients in a major sector of the stock market (and where

the market is, in general, dominated by the Big 5). KWTF clearly has a distinctive presence in the property companies sector and this is something we investigate in our study. CL is about one-third the size of PW based on audit fees across all industries. The disparity between CL and PW is, however, most notable for consolidated enterprises and, to a lesser extent, property companies. PW is four times larger than CL for consolidated enterprises and is three times larger for property companies.¹⁴

Table 2 shows the descriptive statistics of the

¹⁴ Based on market share of audit fees in 1992, DeFond et al. (2000:52) contend that PW is a specialist for property companies and consolidated enterprises, while CL is not. Further, DeFond et al. argue that DTT is a specialist in these sectors and KWTF is a specialist in the property sector. However, as discussed earlier, we do not ascribe large market shares to industry specialism.

Table 3
Correlation matrix of dependent variables

Panel A – DTT and KWTF clients for the period 1993 to 1999 (n = 1240)

	SUBS	CATA	QUICK	DE	ROI	FOREIGN	YE	LOSS	QAR	POST	DTT
LTA	0.58	-0.34	-0.07	0.25	0.21	0.01	0.20	-0.32	-0.16	0.03	-0.34
SUBS		-0.31	-0.11	0.21	0.05	-0.05	-0.01	-0.09	-0.07	0.02	-0.22
CATA			0.18	-0.28	0.05	0.16	-0.05	-0.04	-0.02	-0.04	0.18
QUICK				-0.07	0.03	-0.01	0.06	0.00	-0.08	0.04	-0.01
DE					-0.02	0.02	0.01	0.02	-0.05	0.11	-0.02
ROI						0.03	0.05	-0.15	-0.08	-0.08	-0.05
FOREIGN							0.10	0.01	0.09	0.11	0.16
YE								-0.10	-0.01	0.03	-0.19
LOSS									0.33	0.20	0.17
QAR										0.18	0.10
POST											0.02

Panel B – PW, CL, and PwC clients for the period 1994 to 2001 (n = 737)

	SUBS	CATA	QUICK	DE	ROI	FOREIGN	YE	LOSS	QAR	POST	PW
LTA	0.47	-0.40	-0.10	0.34	0.24	0.13	0.17	-0.29	-0.14	0.00	0.29
SUBS		-0.14	-0.16	0.38	0.02	0.15	-0.02	-0.07	-0.04	0.01	0.08
CATA			0.02	-0.27	-0.05	0.11	-0.05	0.04	-0.01	-0.11	-0.17
QUICK				-0.20	0.10	-0.05	-0.07	-0.02	-0.11	0.10	0.06
DE					-0.06	0.11	0.07	0.00	0.06	0.06	0.13
ROI						0.06	-0.02	-0.30	-0.31	-0.13	0.12
FOREIGN							0.32	-0.11	-0.04	0.04	-0.07
YE								-0.19	0.03	0.08	-0.07
LOSS									0.22	0.29	-0.11
QAR										0.06	-0.02
POST											-0.08

LTA = natural log of total assets;
SUBS = square root of the number of subsidiaries;
CATA = current assets divided by total assets;
QUICK = current assets (minus inventories) divided by current liabilities;
DE = long-term debt divided by total assets;
ROI = earnings before interest and taxes divided by total assets;
FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;

YE = dummy variable (1 = non-March 31 fiscal year end);
LOSS = dummy variable (1 = loss reported in current or prior three years);
QAR = dummy variable (1 = qualified audit opinion in current year);
POST = post-merger observations;
DTT = dummy variable (1 = an incumbent Deloitte Touche Tohmatsu auditee); and
PW = dummy variable (1 = an incumbent Price Waterhouse auditee).

Table 4
Audit fee estimation of KWTF and DTT clients – pooled 1993 to 1999 (n = 1,240)

	<i>Panel A</i>			<i>Panel B</i>		
	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>
Intercept	0.445	2.135	0.033	0.488	2.393	0.017
LTA	0.381	25.314	0.000	0.380	25.304	0.000
SUBS	0.080	8.226	0.000	0.080	8.213	0.000
CATA	0.828	10.468	0.000	0.828	10.478	0.000
QUICK	-0.030	-4.288	0.000	-0.030	-4.408	0.000
DE	-0.209	-1.326	0.185	-0.202	-1.262	0.207
ROI	-0.044	-2.520	0.012	-0.042	-2.518	0.012
FOREIGN	0.258	3.231	0.001	0.263	3.279	0.001
YE	-0.017	-0.580	0.562	-0.018	-0.605	0.545
LOSS	0.169	5.013	0.000	0.168	4.987	0.000
QAR	0.088	1.397	0.163	0.085	1.344	0.179
<i>Experimental variables</i>						
POST	0.096	1.839	0.066	0.024	0.811	0.417
DTT	0.440	9.950	0.000	0.393	11.451	0.000
POST x DTT	-0.107	-1.685	0.092			
F-statistic		117.913	0.000		127.301	0.000
Adjusted R ²			0.556			0.550

The independent variable is LAF (natural log of audit fees)

LTA = natural log of total assets;
SUBS = square root of the number of subsidiaries;
CATA = current assets divided by total assets;
QUICK = current assets (minus inventories) divided by current liabilities;
DE = long-term debt divided by total assets;
ROI = earnings before interest and taxes divided by total assets;
FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;
YE = dummy variable (1 = non-March 31 fiscal year end);
LOSS = dummy variable (1 = loss reported in current or prior three years);
QAR = dummy variable (1 = qualified audit opinion in current year);
POST = post-merger observations;
DTT = dummy variable (1 = an incumbent Deloitte Touche Tohmatsu auditee).

All t-statistics are White's t-statistics and p-values are two-tail.

data used in the regressions. The data come from the non-financial listed companies audited by DTT, KWTF, PW, and CL. The descriptive statistics are representative of listed firms in general and are similar to the summary statistics reported in DeFond et al. (2000). Current assets make up 45% (40%) of total assets for DTT/KWTF (CL/PW) clients, and the long-term debt ratios are comparatively low at 8%. Companies have poor profitability based on ROI, and 35% (33%) of DTT/KWTF (CL/PW) clients report net losses. Our time period covers several crisis periods for the economy, including the Asian financial turmoil, and this helps explain the low profitability.

Correlation matrices for the variables used in examining the DTT/KWTF merger and the PW/CL merger are shown in Table 3. The highest correlation is between client size and the number of subsidiaries (which is a proxy for a firm's complexity).

However, the correlation coefficient of 0.58 is well below the threshold level of 0.8 that is usually deemed to be evidence of significant multicollinearity (Judge et al., 1988:868). Variance inflation factors (VIFs) are calculated for the regression equations that follow. None of the VIFs exceed 3 and this gives further confidence that multi-collinearity is not a major problem.

3. Empirical results

3.1. Big 5 and non-Big 5 merger

To examine the pricing of post-merger DTT audit services for pre-merger KWTF clients, we use the OLS regression model to estimate audit fees for a pooled cross-sectional sample of all KWTF and DTT clients for a seven-year period straddling the merger. To capture the audit fee differences between DTT and KWTF we use three dummy variables, DTT, POST, and POST x DTT.

Table 5**Audit fee estimation of KWTF and DTT audited property companies – pooled 1993–1999 (n = 308)**

	Panel A			Panel B		
	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value
Intercept	-0.761	-2.614	0.009	-0.739	-2.572	0.011
LTA	0.442	18.965	0.000	0.441	19.017	0.000
SUBS	0.086	6.549	0.000	0.086	6.567	0.000
CATA	0.566	3.711	0.000	0.566	3.733	0.000
QUICK	-0.010	-1.461	0.145	-0.010	-1.486	0.138
DE	0.426	1.435	0.152	0.440	1.488	0.138
ROI	-0.135	-0.601	0.548	-0.117	-0.544	0.587
FOREIGN	0.591	3.856	0.000	0.597	3.922	0.000
YE	-0.149	-2.568	0.011	-0.149	-2.575	0.011
LOSS	0.189	2.826	0.005	0.186	2.783	0.006
QAR	0.013	0.095	0.925	0.012	0.083	0.934
<i>Experimental variables</i>						
POST	0.054	0.831	0.407	0.035	0.647	0.518
DTT	0.368	5.380	0.000	0.348	6.286	0.000
POST x DTT	-0.049	-0.462	0.644			
F-statistic		89.051	0.000		96.706	0.000
Adjusted R ²			0.789			0.789

The independent variable is LAF (natural log of audit fees)

LTA = natural log of total assets;
 SUBS = square root of the number of subsidiaries;
 CATA = current assets divided by total assets;
 QUICK = current assets (minus inventories) divided by current liabilities;
 DE = long-term debt divided by total assets;
 ROI = earnings before interest and taxes divided by total assets;
 FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;
 YE = dummy variable (1 = non-March 31 fiscal year end);
 LOSS = dummy variable (1 = loss reported in current or prior three years);
 QAR = dummy variable (1 = qualified audit opinion in current year);
 POST = post-merger observations;
 DTT = dummy variable (1 = an incumbent Deloitte Touche Tohmatsu auditee).
 All t-statistics are White's t-statistics and p-values are two-tail.

DTT takes the value one (1) if the auditor prior to the merger is DTT,¹⁵ if the auditor prior to the merger is KWTF then DTT is coded zero (0). POST is coded one (1) for a post-merger observation. The interaction term POST x DTT represents an original DTT client for periods after the merger. In the presence of the interaction term, DTT captures the premium DTT earns over KWTF prior to the merger. Because there is some evidence of heteroskedasticity, we use White's (1980) method to compute the t-statistics in all regressions.

The regression results are reported in Panel A, Table 4. The model is significant at $p < 0.01$ and has an adjusted R^2 of 55.6%. DTT is significant

and positive at $p < 0.01$, which confirms a DTT premium prior to the merger. The coefficient of 0.44 translates into a 55.3% premium. Importantly, POST is significant ($p = 0.066$) and the coefficient of 0.096 translates to an audit fee increase of 10.1% for KWTF clients after the merger. The coefficients POST and POST x DTT indicate little change in audit fees for DTT's incumbent clients after the merger.¹⁶ Except for DE, all variables have their expected signs and most are statistically significant. Client size and complexity are positively related to audit fees. Contrary to expectation, DE has a negative sign although the coefficient is not significant. The negative but non-significant coefficient also occurs in Tables 6 to 8. DeFond et al. (2000:56) also report a negative and non-significant coefficient on the debt ratio.

An alternative specification of the model is reported in Panel B. Here, the interaction term, POST x DTT is omitted. Overall there is no sig-

¹⁵ Note, if the original auditor is DTT then DTT is coded one (1) throughout the period 1993 to 1999.

¹⁶ The results suggest a fee decrease of less than 0.1%: $(e^{0.096} - 1) + (e^{-0.107} - 1) = -0.1\%$.

Table 6
Audit fee estimation of DTT clients

	1998 (<i>n</i> = 188)			1999 (<i>n</i> = 163)		
	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value
Intercept	-0.023	-0.040	0.968	0.703	1.196	0.234
LTA	0.425	10.424	0.000	0.373	8.471	0.000
SUBS	0.068	2.833	0.005	0.081	2.794	0.006
CATA	1.157	5.038	0.000	0.906	3.489	0.001
QUICK	-0.054	-4.227	0.000	-0.016	-1.046	0.298
DE	-0.246	-0.911	0.364	-0.037	-0.060	0.952
ROI	-0.134	-1.330	0.185	-0.030	-3.610	0.000
FOREIGN	0.151	0.761	0.448	0.088	0.380	0.704
YE	-0.102	-1.335	0.184	0.016	0.158	0.874
LOSS	0.104	1.176	0.241	0.082	0.808	0.420
QAR	0.159	1.294	0.197	-0.025	-0.143	0.887
<i>Experimental variables</i>						
DTT	0.342	3.912	0.000	0.295	2.698	0.008
F-statistic		25.195	0.000		15.063	0.000
Adjusted R ²			0.587			0.488

The independent variable is LAF (natural log of audit fees)

LTA = natural log of total assets;
 SUBS = square root of the number of subsidiaries;
 CATA = current assets divided by total assets;
 QUICK = current assets (minus inventories) divided by current liabilities;
 DE = long-term debt divided by total assets;
 ROI = earnings before interest and taxes divided by total assets;
 FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;
 YE = dummy variable (1 = non-March 31 fiscal year end);
 LOSS = dummy variable (1 = loss reported in current or prior three years);
 QAR = dummy variable (1 = qualified audit opinion in current year);
 DTT = dummy variable (1 = an incumbent Deloitte Touche Tohmatsu auditee).
 All t-statistics are White's t-statistics and p-values are two-tail.

nificant change in fees for the portfolio of DTT and KWTF clients after the merger (the coefficient on POST is not significant). However, incumbent DTT clients pay significantly higher audit fees than KWTF clients both before and after the merger (this result is given by the DTT variable). These findings mirror the results in Panel A.

KWTF has the highest market share of property company clients (see Table 1) and the property industry is a very important segment of the economy in Hong Kong. In light of this, we redo the regressions for the property company clients of DTT and KWTF and the results are shown in Table 5. DTT is positive and highly significant, and the coefficient of 0.368 indicates a fee premium of 44.5% over KWTF. The lower fees charged by KWTF might be one reason why they have a large market share in the property sector (DeFond et al., 2000). In contrast to Table 4, POST is not significant, suggesting no fee increases for KWTF clients in the property sector after the merger. The lack of increase in fees for property clients may be due to the fact that relative to clients in other industries,

the pre-merger discount KWTF fees in property companies are smaller. The results in Panel B are qualitatively the same as those in Panel A.

To further investigate the results obtained for POST x DTT, we model the post-merger cross-sectional DTT fees in 1998 and 1999 to examine the persistence of the DTT premium in the second and third year after the merger. The dummy variable DTT, which denotes a client audited by DTT before the merger (i.e. an incumbent client), is used as the experimental variable. A significantly positive coefficient for DTT here would indicate the persistence of the pre-merger DTT premium into the post-merger year. Table 6 presents the 1998 and 1999 DTT fee estimations. As shown, DTT is significant and positive in both 1998 and 1999 at the $p < 0.01$ levels. Of interest is the decrease in the coefficients which, when translated, signifies a decrease from 40.8% to 34.3% in the DTT premia from 1998 to 1999. Together with the results obtained from Table 4, these decreases suggest a gradual, rather than abrupt, increase in audit fees when KWTF merges with DTT in 1997.



Table 7
Audit fee estimation of PW, CL, and PwC clients – pooled 1994–2000 (n = 737)

	<i>Panel A</i>			<i>Panel B</i>		
	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>
Intercept	-0.504	-1.705	0.089	-0.473	-1.596	0.111
LTA	0.461	22.479	0.000	0.460	22.403	0.000
SUBS	0.086	6.953	0.000	0.086	6.978	0.000
CATA	1.048	10.422	0.000	1.045	10.344	0.000
QUICK	-0.063	-6.016	0.000	-0.064	-6.202	0.000
DE	-0.512	-1.849	0.065	-0.520	-1.876	0.061
ROI	-0.079	-0.841	0.400	-0.080	-0.856	0.392
FOREIGN	0.244	2.718	0.007	0.245	2.741	0.006
YE	-0.005	-0.121	0.904	-0.006	-0.142	0.887
LOSS	0.181	3.522	0.001	0.178	3.494	0.001
QAR	0.256	2.768	0.006	0.256	2.776	0.006
<i>Experimental variables</i>						
POST	0.091	1.622	0.105	0.055	1.289	0.198
PW	0.152	2.716	0.007	0.122	2.826	0.005
POST x PW	-0.064	-0.803	0.422			
F-statistic		108.049	0.000		117.065	0.000
Adjusted R ²			0.666			0.654

The independent variable is LAF (natural log of audit fees)

LTA = natural log of total assets;
SUBS = square root of the number of subsidiaries;
CATA = current assets divided by total assets;
QUICK = current assets (minus inventories) divided by current liabilities;
DE = long-term debt divided by total assets;
ROI = earnings before interest and taxes divided by total assets;
FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;
YE = dummy variable (1 = non-March 31 fiscal year end);
LOSS = dummy variable (1 = loss reported in current or prior three years);
QAR = dummy variable (1 = qualified audit opinion in current year);
POST = post-merger observations;
PW = dummy variable (1 = an incumbent Price Waterhouse auditee).

All t-statistics are White's t-statistics and p-values are two-tail.

There is no evidence of any fee increase for KWTF clients in the property industry when we restrict the sample to property firms (the results are not tabulated here).

3.2. Within Big 5 merger

To examine the change in audit fees when PW merged with CL, we estimate pooled cross-sectional fees for the seven-year period similarly straddling the merger. To capture the fee differences between PW and CL we construct three dummy variables, PW, POST, and POST x PW. PW is coded one (1) if the auditor is PW prior to the merger; if the auditor prior to the merger is CL then PW is coded zero (0). POST is coded one (1) for a post-merger observation. The interaction term POST x PW represents an original PW client for periods after the merger. The results are shown in Panel A, Table 7. The model is significant at $p < 0.01$ and the adjusted R² is 66.6%. PW is positive

and significant at $p < 0.01$ indicating a pre-merger PW premium over CL. The coefficient of 0.152 translates to a 16.4% PW premium over CL. While the Big 5 firms are often assumed to be a homogeneous group, our results indicate otherwise. The fee premium of 16.4% for PW over CL is statistically significant and is substantial in monetary terms. The coefficient estimates for POST and POST x PW are not statistically significant and thus there is no evidence that audit fees change after the merger. These results are corroborated in the alternative model specification where the interaction term, POST x PW, is excluded (see Panel B).

We repeat the analyses for the two industries (consolidated enterprises and property companies) where PW had a much larger market share of audit fees than CL. The results are shown in Table 8. PW earned a significant fee premium over CL for the two industries. The fee premium of 24.5% contrasts with the premium over all industries of

Table 8

Audit fee estimation of PW, CL, and PwC audited property companies and consolidated enterprises – pooled 1994–2000 (n = 448)

	<i>Panel A</i>			<i>Panel B</i>		
	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>p-value</i>
Intercept	-0.805	-1.988	0.047	-0.790	-1.941	0.053
LTA	0.471	15.518	0.000	0.471	15.471	0.000
SUBS	0.099	4.947	0.000	0.099	4.959	0.000
CATA	0.977	7.462	0.000	0.976	7.411	0.000
QUICK	-0.047	-3.437	0.001	-0.048	-3.602	0.000
DE	-0.651	-1.662	0.097	-0.658	-1.692	0.091
ROI	-0.071	-0.721	0.472	-0.072	-0.727	0.468
FOREIGN	0.583	4.015	0.000	0.584	4.018	0.000
YE	-0.074	-1.154	0.249	-0.074	-1.173	0.242
LOSS	0.208	2.749	0.006	0.207	2.743	0.006
QAR	0.344	2.731	0.007	0.344	2.733	0.007
<i>Experimental variables</i>						
POST	0.022	0.266	0.791	0.007	0.110	0.913
PW	0.219	2.750	0.006	0.207	3.393	0.001
POST x PW	-0.028	-0.247	0.805			
F-statistic		80.577	0.000		87.476	0.000
Adjusted R ²			0.698			0.699

The independent variable is LAF (natural log of audit fees)

LTA = natural log of total assets;
 SUBS = square root of the number of subsidiaries;
 CATA = current assets divided by total assets;
 QUICK = current assets (minus inventories) divided by current liabilities;
 DE = long-term debt divided by total assets;
 ROI = earnings before interest and taxes divided by total assets;
 FOREIGN = proportion of subsidiaries that are incorporated outside Hong Kong;
 YE = dummy variable (1 = non-March 31 fiscal year end);
 LOSS = dummy variable (1 = loss reported in current or prior three years);
 QAR = dummy variable (1 = qualified audit opinion in current year);
 POST = post-merger observations;
 PW = dummy variable (1 = an incumbent Price Waterhouse auditee).

All t-statistics are White's t-statistics and p-values are two-tail.

16.4% (see Table 7). PW's large market share and CL's low market share indicates different reputations in the two industries and this leads to a fee premium for PW. The non-significant coefficients on POST and POST x PW indicate the PW premium persisted after the merger for these two industries. There is no evidence that CL increased their fees after the merger for clients in the consolidated industries and property companies sectors. These results are corroborated when we use the alternative model specification (the results are shown in Panel B).

3.3. Sensitivity tests

Model specification is very important in audit fee studies (Pong and Whittington, 1994; McMeeking et al., 2003b; Peel and Roberts, 2003). Accordingly, we run a number of alternative models to examine how robust our main results are.¹⁷

Pong and Whittington (1994:1075) advocate a quadratic model where sales, assets, and their squared terms appear. They also include a number of interactive terms and use raw numbers rather than logarithmic transformations (for fees, assets, sales) and square root transformations (for the number of subsidiaries). As a sensitivity test we use the Pong and Whittington model. We find that the results for the experimental variables of interest (DTT, POST, POST x DTT, PW, and POST x PW) yield the same conclusions as the analyses presented earlier, and so we do not tabulate the results in this paper.

McMeeking et al. (2003a) also use interactive

¹⁷ We also use the RESET test (Ramsey, 1969) to assess the appropriateness of all our model specifications. The results for the RESET test are not statistically significant and so there is no evidence of model mis-specification.

terms as sensitivity tests in their study. They report results that are not consistent with their maintained hypotheses and they find that the Big 5 variable is not significant in some specifications of their audit fee models. We use similar interactive terms in our sensitivity tests. We find a few significant interaction terms but, crucially, the results for our main experimental variables remain qualitatively the same.

A recent strand of research has examined the time series characteristics of audit fees. There is some evidence of non-stationarity (unit roots) in the data used in audit fee research and so error-correction models have been advocated (Chou and Lee, 2003; McMeeking et al., 2003b). We do not use these procedures in our tests because of the limited time series data we examine.

4. Discussion and conclusion

Our results indicate that there are across-firm as well as within-firm pre- and post-merger fee differences between Big 5 and non-Big 5 auditors. This is consistent with the prediction that higher-quality auditors have higher cost functions due to a costly investment in quality, and non-Big 5 auditors merge with the Big 5 to become quality-differentiated auditors. In this scenario, auditor mergers are efficient (Sullivan, 2002), and they increase overall audit quality and benefit consumer welfare.

We find some evidence that the audit fees for incumbent KWTF clients increase after the merger with DTT. This increase is gradual rather than abrupt and the fees still lag behind those charged to incumbent DTT clients. Somewhat surprisingly, we find no evidence of an increase in fees for property companies, a sector for which KWTF was the major supplier of audits. We attribute this in part to the fact that the fee discount prior to the merger was lower than in non-property sectors. Our results provide an answer for the question posed by DeFond et al. (2000:66), who asked "The unanswered questions are whether Deloitte & Touche will significantly raise prices on former KWTF clients, and whether these clients are prepared to pay a premium for a Big 6 industry specialist when they have been accustomed to paying substantially lower fees to KWTF". While there is evidence of a gradual increase in fees for most industries, audit fees for property companies (where, according to DeFond et al., KWTF is a specialist auditor) do not increase.

In Hong Kong, and prior to the merger, PW had a much more visible standing than CL because of

its much larger market share and this manifested itself in earning premium fees. The fee premium is even larger in the two industries where PW had a market share three times (or more) higher than CL. Our findings indicate that the Big 5 as a group masks important differences between the constituent firms (at least at the regional level) and they suggest that more detailed breakdowns may be necessary. Subsequent to the merger we find that CL does not significantly increase its fees. Thus PW retains its premium fees over CL in the post-merger period. There are two likely causes for this finding. First, the PW premium fee is auditor specific and CL clients may not be prepared to pay higher fees after the formation of PwC. Second, a Big 5 merger is a probable response to increased market competition and some of the efficiencies created by the merger are passed along to the clients.¹⁸ Which one of the two causes is more valid, awaits further research.

Auditor merger provides a fertile milieu to enhance our understanding of the structure of the market for audit services. We examine a specific issue and our study represents a first study that estimates auditor premia before and after auditor mergers. We also add to the small but growing literature on studies of the effects of supplier mergers (for example, see Werden et al., 1991). One possible extension to our research is to evaluate the merger effect on the supply of and demand for audit services. Another extension is to consider the impact of the mergers on non-audit service fees. One possible motive for a merger is that firms seek to increase consultancy fees.¹⁹ Unfortunately, data on non-audit service fees are not available in Hong Kong at the present time. These potential extensions, and the vexing issue of how (or whether) to classify auditors as specialists, represent limitations in our study. Other limitations include the fact that our results are based on just two mergers and so they are not generalisable to other situations, and we do not include non-listed clients in our analyses of market share and audit fees.

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¹⁸ Increased competition is cited as a reason for PW to merge with CL.

¹⁹ We thank a reviewer for making this suggestion. Unlike some other countries there is no requirement for companies in Hong Kong to disclose fees paid for non-audit services.

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Further evidence on the roots of public sector operational (value-for-money) auditing: a response to Flesher and Zarzeski

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Abstract—Flesher and Zarzeski in their recent examination of the North American origins of value-for-money auditing highlight the reluctance of public sector auditors in Australia, New Zealand and Britain to assume operational auditing as part of their mandate until the 1970s, and then only gradually. It is suggested here that the very different constitutional forms of Westminster and American governments and their associated conventions denied auditors-general the authority to follow the American example. In their paper Flesher and Zarzeski also recognise Canada as an unusually early adopter of operational auditing, although suggesting that actual practices owed little to direct borrowings from the US. Canada was also the primary influence on the form taken by value-for-money auditing in other Westminster countries. It is suggested here that the decision by Canada in the early 1960s to recruit auditors-general from the private sector accelerated the transfer of value-for-money auditing to the public sector as did the admiration of Canadian auditors-general for the work of the GAO, even though they were constitutionally constrained in the extent of their borrowings.

1. Introduction

In their examination of the origins and spread of value-for-money auditing¹ across English-speaking countries in the latter decades of the 20th century, recently published in *Accounting and Business Research*, Flesher and Zarzeski (2002) highlight the slow diffusion of public sector value-for-money audit practices from North America and the apparent indifference of Canadian auditors-general, who were early adopters of value-for-money auditing, to the considerable value-for-money auditing experience of the United States General Accounting Office (GAO). In the cases of New Zealand, Australia² and England these ‘incongruities’ are especially perplexing, suggest Flesher and Zarzeski, ‘[g]iven the similarity of management practices among organisations’ (2002:103) and that these countries enjoy the advantage of sharing a common language with the US and Canada. ‘If there was a language barrier’, note Flesher and Zarzeski (2002:103), ‘the lack of diffusion of auditing ideas might be more understandable’. Even value-for-money pioneers such as the American Mary E. Murphy were ‘unable to popularise the subject in England, Australia, and New Zealand’ (2002:103). So perplexing is the ostensible indifference of Westminster auditors-general outside Canada that at the conclusion of their paper Flesher and Zarzeski ask themselves ‘what

can explain the lack of a wider distribution of value-for-money-auditing concepts and practices?’ (2002:103).

In an effort to explain the apparent anomalies that they identify in the adoption of public sector operational auditing, Flesher and Zarzeski briefly refer to the possibility of a ‘not invented here’, or ‘NIH’ syndrome’ (2002:103); that is a reluctance to adopt systems of audit which may have been developed as responses to circumstances peculiar to other jurisdictions. It is the primary purpose of the present paper to advance this suggestion of Flesher and Zarzeski. A further purpose is to suggest reasons for Canada’s much more ready acceptance of the virtues of value-for-money auditing, as identified by Flesher and Zarzeski, and to investigate the extent to which Canada was influenced by the GAO.

It is proposed here that the slow diffusion from the US of value-for-money auditing to the public sectors of Australia, New Zealand and England until the latter decades of the 20th century can be explained mainly by fundamental differences in the constitutional conventions of Westminster governments and that of the US (see for example Skene, 1985). Belief within Westminster governments outside North America and among their au-

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¹ Value-for-money auditing, management auditing, efficiency auditing and performance auditing are terms which are used in different countries to refer to operational auditing. Throughout this paper reference will be made to value-for-money auditing.

² When referring to Australia and Canada, which have both national and state or provincial public sector auditors, this paper will be concerned with only the national audit bodies.

ditors-general that their form of government was unable to accommodate readily the American innovations in public sector audit meant that Australia, New Zealand and England, in the absence of public sector management reforms, were at first reticent in adopting American value-for-money auditing principles and practices. The United States and the Westminster governments of Australia, England, New Zealand and Canada may have many common characteristics as liberal democracies. However, the 'responsible' form of government in these Westminster countries, whereby the members of the executive must come from the legislature, creates a set of accountability requirements significantly different from that of the US where the powers of the executive and the legislature are strictly separated. Accordingly, Westminster constitutional conventions placed the auditor-general in a very different relationship to the legislature to that which characterised the GAO, thereby creating a different set of expectations for auditors-general. In particular, the 'watchdog' role of Westminster auditors-general has been more important than any 'bloodhound' role which would require auditors-general to give priority to the detection of waste and inefficiency.

Establishing the constitutional basis for this stance by auditors-general and its remarkable resilience until late in the 20th century is the first task of this paper.

2. Constitutional suspicions, Westminster accountability and value-for-money auditing

In Westminster governments, suspicion of executive intentions has defined the accountability relationship between the executive and the legislature. The conventions of financial control, including those determining audit, which were adopted from England by its colonies were based upon a long history of constitutional apprehension and jealousies between parliament and the executive, in particular those arising out of the constitutional struggles in the 17th century (Great Britain, 1857, Appendix I:562; Clode, 1869, Vol.II:759–763; Gordon, 1935:233; Einzig, 1959). Well into the 20th century the primary and constant concerns of parliament, as the ultimate authority for the executive to raise money to implement its policies, were how much money the executive wanted to raise and how it intended to spend this money (Normanton, 1966; Great Britain, 1857, Appendix I:519; Funnell 1994). Parliament was very careful how and to what degree it granted financial assistance to the executive because it knew that once the money had been appropriated to the uses sought by the executive then parliament's ability to interfere and control became fettered (Phillips and

Jackson, 1978:14, 31–32). Control over expenditure by the legislature after revenue had been raised was bounded, and 'necessarily and properly so' argued Durell (1917:19), for administration is the exclusive constitutional prerogative of the executive. Within departments of state, however, an ever vigilant and probing Treasury responsible for the enforcement of financial regulations and the protection of public monies ensured that matters of economy and the wise use of resources were an abiding concern of responsible officers (Roseveare, 1969; Normanton, 1966).

Recognising well-entrenched constitutional concerns of parliament, at the core of the 'classical' system of public sector audit established by William Gladstone in 1866 with the English Exchequer and Audit Departments Act (hereafter the 1866 Audit Act), which remains the foundation for public sector audit in Westminster governments, was a concern by parliament and the comptroller and auditor-general for ensuring that money was appropriated and used according to legislated approvals. The focus was financial legality and regularity; that is, ensuring that proper procedures were followed by the executive and documented at all times (see especially section 32 of the 1866 Audit Act). Constitutional propriety was an essential guarantee that the authority of parliament would not again be threatened by the executive. In 1974 when the Royal Commission on Australian Government Administration (RCAGA) was undertaking the first review of Australian public administration since 1917, auditor-general Steele Craik reminded the commission that the Australian Commonwealth Audit Act 1901 was first and foremost meant to be a check on the regularity and legality of public service expenditures (AAO, 1974:4). The noted public sector audit authority Normanton, in a submission to the British Select Committee on Procedure in 1978, observed that the Gladstonian system of audit with its obsession for regularity and legality remained unquestioned in England because in the administrative form of governance which had applied since the 19th century, as opposed to the present day managerial form, 'the classical system of accountability created in 1866 appeared to suffice' (Great Britain, 1977–78, Vol.II, Appendix 43:133).

Tomkins (1987:63) in his examination of British public sector audit prior to the passage of the National Audit Office Act in 1983 was unable to find any evidence that the public sector auditor had established *discrete audits* which were concerned with efficiency or effectiveness. Instead, most of the public sector auditor's observations of a value-for-money nature were incidental to audits of regularity and legality. They were irregular criticisms prompted by particularly objectionable examples of abuse of public office and public funds. Other

authors are agreed that, prior to the civil service reforms of the late 1970s and early 1980s, concern for efficiency by public sector administrators was 'symbolic rather than substantive ... The lack of financial training for permanent secretaries made their traditional stewardship of regularity difficult enough quite apart from any notions of economising' (Gray and Jenkins, 1986:182).

Efficient management in Westminster governance had never been the priority of senior bureaucrats (Garrett, 1972:11–12). Yet, irrespective of the persuasiveness of the GAO's success with value-for-money auditing since the 1940s, this situation was only to be expected prior to the public management reforms in the 1980s when an absence of common, agreed objectives and value-for-money standards across programs and departments throughout Westminster governments made any attempts at performance evaluation extremely difficult (Mazey, 1978:15). The Australian Senate Standing Committee on Social Welfare (Baume Committee) (1979:68–9) found that 'there had been very few instances in which adequate goals have been established at government level (V)ery few departments state adequate objectives either for sections within departments or for programs that they operate'. Sir Lennox Hewitt, a powerful Australian public sector mandarin, when asked by the RCAGA in 1974 to provide a copy of his department's objectives replied in surprise that he had 'not previously encountered the suggestion of objectives for a Department of State' (quoted in Weller and Smith, 1977:20). If objectives were present they were usually vague, often unrealistic, hard to measure, multiple and conflicting (see Rutman, 1983:9). This of course suited politicians because it made it more difficult to hold them accountable for the performance of their departments. Certainly, the effectiveness with which government policies were being achieved was not to be a concern of Westminster auditors-general. They were not to question the right of democratically elected governments to govern as they saw fit with the policies that they favoured (Wilenski, 1979).

Guthrie and Parker (1991, 1999) and Funnell (1998) found that when Australian auditors-general have strayed, even if inadvertently, from their mandate and made judgements about the aims and effectiveness of executive programs then invariably they have been attacked by the government and its departments for exceeding their legislated remit (see also Dillon, 1985). Reactions such as this, as Flesher and Zarzeski note with reference to the experiences of the Hong Kong auditor-general, certainly contributed to 'a lack of confidence on the part of audit directors' (2002:102), thereby delaying the spread of value-for-money auditing. Executive apprehension in Westminster jurisdic-

tions about the possible political consequences of auditors-general passing judgment on matters of government policy has been reflected in audit legislation in England, Australia and New Zealand which explicitly prohibits auditing of policy effectiveness. Most recently, the New Zealand Public Audit Act 2001 (section 19(3)) requires that the auditor-general's inquiries are 'to be limited to the extent to which the public entity is using its resources in a manner consistent with that policy'. The British National Audit Office Act 1983 (section 6(2)) also made it clear that the comptroller and auditor-general was not to comment upon the merits of the government's policy objectives while conducting value-for-money audits, for which the comptroller and auditor-general was now given explicit legislated authority.

Any profound change to the audit mandate of Westminster auditors-general to expressly include value-for-money audits, which were dependent upon the formulation of clearly set objectives for programmes and departments, had to be preceded by the extensive reforms now known as the new public management which were forced upon governments by economic necessity. As budget deficits increased in the 1970s, pressure was exerted on governments to ensure that taxpayers were getting value for their money by making government departments and agencies more accountable for their performance (Canada, 1977:1,29; Allard, 1981:38; Bailey, 1977:28; RCAGA, 1976, Appendix I:16–23). It was widely recognised within Westminster governments that demands for enhanced accountability, to encompass the efficiency with which governments provided services and managed public resources, could not be met with existing methods and institutions in their traditional, and largely 19th century, form. This meant that the highly circumscribed public sector audit function which had been favoured for the past century was no longer sufficient (see for example Royal Commission on Australian Government Administration (RCAGA) 1976, Appendix I:16–23; Flesher and Zarzeski, 2002:100). The GAO, as Flesher and Zarzeski have confirmed in their paper, had realised this much earlier than Westminster jurisdictions.

3. The influence of the GAO in the rise of value-for-money auditing

Flesher and Zarzeski (2002:102) justifiably conclude that 'development of VFM audits outside the US was seemingly *not* based on the many decades of US experience' for, indeed, there is little evidence of substantial *direct* borrowings by Australia, New Zealand or England. However, the considerable value-for-money audit experience of the GAO was closely examined by Westminster auditors-general (see for example RCAGA, Vol.4,

Appendix 4F:157). Australia and Canada, discussed in some detail in the following section, seemed to have taken particular interest in the GAO. In the case of Australia, in the early 1970s at least two formal visits were made to the GAO by groups of officers from the office of the Australian auditor-general from which detailed reports were made assessing the applicability of the GAO's value-for-money audit practices, principles and organisation (Steele Craik, 1976:15; *Canberra Times*, 22 February 1977). According to the inaugural head of the performance auditing division at the Australian auditor-general's office, in the late 70s and early 80s 'the model being pursued under Mr. Steele Craik's Auditor-Generalship³ ... is closest to that of the GAO ...' (John Jones, Evidence before the Joint Committee of Public Accounts (JCPA) 1986:395). This was also the understanding of the chairman of the JCPA, David Connolly (Australian Commonwealth House of Representatives (HR) debates, 25 October 1978:2300). Possibly the most obvious evidence of the, albeit limited, direct influence of the GAO subsequent to the reform of Australian audit legislation in 1978 was the decision by Steele Craik to follow the well-established practice in the GAO and locate value-for-money auditing within a separate, specialised division which for the first time relied upon a wide range of disciplines other than accounting (Connolly, House of Representatives debates, 25 October 1978:2300; Funnell, 1998; also see RCAGA, 1976, Vol.4, Appendix 4F:159). While this may have shown that auditor-general Steele Craik in the early 1970s identified with the broader scope of the GAO audit, he did not see himself as emulating uncritically the role of the GAO. Instead, he accepted that he was constrained by the conventions of Westminster government which, as noted above, at the time accorded auditors-general a circumscribed role in which value-for-money matters were never the primary concern.

Reflecting the divergent constitutional histories of the US and Westminster governments, the responsibilities of GAO and the Australian Audit Office were heavily influenced by the very different relationship each had with the legislature, the body to which they reported. Unlike the English, Canadian, New Zealand and Australian audit offices, which are separate public bodies working on behalf of but independent from the legislature, the GAO is a part of the legislature (Great Britain, 1981, Minutes of Evidence, 11 June 1980:6). Indeed, Pois (1979:4) has described the comptroller general of the United States (the head of the GAO) as 'quasi-legislative, quasi-executive and

quasi-judicial'. In one of his submissions to the RCAGA (1976, Vol.4, Appendix 4F:159) Steele Craik recognised that the

'United States comptroller-general is one of the foremost exponents of the 'comprehensive audit' ... Bearing in mind the basic differences between the governmental systems of our respective countries, and the special role of the Government (*sic*) Accounting Office as an 'arm of Congress', I have reservations whether, as a matter of both principle and practice, it would be desirable for the Auditor-General for Australia to pursue a fully comparable goal.'

The hesitant experiences of Westminster auditors-general outside North America, as Flesher and Zarzeski (2002:101) point out, were in stark contrast to the Canadians for, although Canada shares a common constitutional heritage with Australia, New Zealand and England, its experience of value-for-money auditing has been significantly different. The next section elaborates Flesher and Zarzeski's exploration of Canada's experience of value-for-money by examining the reasons for the progressive stance taken by Canada, in particular the private sector origins of Canadian auditors-general from the 1960s, the importance of the Canadian example for other Westminster auditors-general and the extent to which the GAO influenced Canadian value-for-money auditing.

4. The Canadian experience

Canadian auditors-general from the 1960s were mostly enthusiastic admirers of value-for-money auditing by the GAO, although arriving at an understanding of value-for-money auditing which recognised the constitutional differences between Canada and the US. The private sector background of Canadian auditors-general at the time value-for-money auditing was introduced in Canada during the 1960s and 1970s ensured that GAO value-for-money auditing practices, which borrowed heavily from the private sector, would not be as easily overlooked as they were in other Westminster jurisdictions. Unlike Canada, no auditors-general in Australia, New Zealand or England were recruited from the private sector during the time in which value-for-money auditing evolved in Canada and the US. Indeed, it is only recently in New Zealand that an auditor-general has been recruited from the private sector. Until the entrenchment of the new public management reforms in the last two decades of the 20th century, a rigid divide in Westminster jurisdictions separated public and private sector cultures and beliefs about appropriate goals and how they should be achieved. Accordingly, few private sector practices were seen as appropriate to the public sector at the higher levels of policy formation and program man-

³ Don Steele Craik was the Australian auditor-general responsible for the introduction of value-for-money auditing in the Commonwealth Government.

agement. This also effectively impeded the ability of the public sector auditor to take advantage of private sector developments.

The principles which directed public sector audit when Maxwell Henderson was appointed Canadian auditor-general in 1960 were still very much those of other Westminster auditors-general as enshrined in the Canadian Audit Act 1878 (Henderson, 1984:162). As a former colony of England, Canada since independence had endeavoured to follow English practice and experience as closely as possible. The first auditor-general appointed under the Audit Act 1878, John Lorn McDougall, wrote in 1879 in his first report to parliament that 'so far as circumstances permit, it is advisable in such contingencies as are not provided for by our statute, to follow the system which has grown up under the English act'. Little had changed when Henderson took office (Henderson, 1984). Despite the close proximity of the US, to consult other sources other than England in matters of public sector audit 'would have been out of the question' (Henderson, 1984:162). Henderson was determined that this state of affairs would change.

Early in his term as auditor-general Henderson established that he was not going to be content to limit his investigations or observations to narrow interpretations of the public sector auditor's mandate. He gave notice that he saw considerable parallels in the work of private and public sector auditors, especially in their ability to assist in management improvement (Henderson, 1984). Central to his vision for modern audit, and consistent with his relationship with parliament, was his determination to continue the practice of public sector auditors for some time, relying on section 70(1) of the Canadian Audit Act 1951, and hunt out instances of 'non-productive' expenditure or inefficiency (Canadian auditor-general, 1984:section 1.01; Henderson 1984:171). Henderson, coming from a long and successful career in private sector management⁴ and consulting, was under no delusions about the task which confronted him:

'I was quite aware that my value-for-money approach would be considered revolutionary among the rank and file of the civil service, Treasury, and the Ottawa establishment generally, most of whom possessed strong pre-conceived ideas as to what the Auditor-general should do and how far he should go' (Henderson, 1984:173).

It was apparent to Henderson that the Westminster model of public sector audit which Canada had loyally pursued since 1878 (and before) had little to offer value-for-money auditing. He therefore turned his attention south to the United States with whose audit office the Canadians 'certainly had more in common than with Westminster so far as accounting and auditing standards were con-

cerned' (Henderson, 1984:184). After several visits by members of the Canadian auditor-general's office to the GAO in the early 60s, when they 'learned a tremendous amount', Henderson was determined to adopt the American approach to value-for-money auditing as a 'blueprint made to order' for his office (Henderson, 1984:185). He did recognise that not all aspects of the GAO's system of audit were appropriate to a Westminster government. Whereas the Comptroller General of the GAO could criticise government policy, the Canadian public sector auditor knew that Westminster conventions, as noted earlier, required that his value-for-money observations would have to be limited to the financial consequences of spending; policy effectiveness was outside his mandate, as it was with the other Westminster public sector auditors.

Coincident with the benefits to be obtained by adopting GAO value-for-money practices, Henderson saw that salvation for the public sector would come from the private sector; a concept which his successor James Macdonell, a management consultant for over 30 years and another chartered accountant, assiduously applied in his dealings with the executive (*Canadian Chartered Accountant*, March 1965:182). Throughout his tenure as Canadian auditor-general, James Macdonell maintained a close association with the private sector to an extent not previously experienced in public sector audit, even under Henderson. This proved to be the key element in bringing the first significant reform of the Canadian Audit Office since 1878. Despite the difficulties that Henderson experienced with his early attempts to institutionalise value-for-money audits, Macdonell was convinced that Henderson was on the right track and that the Canadian public sector auditor had fallen behind that of his counterparts in the US in the scope and performance of his work (Canada, 1973, Minutes of Evidence, 30 October: 11.7). Macdonell shared Henderson's vision that public sector audit should be used in a more positive manner, to assist management to bring about improved use of public sector resources (Macdonell, 1978:29). Macdonell's long association with the private sector had also imbued him with an aversion to poor performance and the need for the public sector to emulate the financial discipline of the private sector (*The Canadian Chartered Accountant*, March 1975:181). To achieve this, Macdonell used the momentum for audit reform which he and Henderson had created to bring

⁴ Although Henderson was the first comptroller and auditor-general to be a qualified chartered accountant he was not the first Canadian auditor-general to come from the private sector. In 1923 Gonthier, a Montreal accountant, was appointed to the post until 1939.

about the appointment of the Review Committee on the office of the auditor-general of Canada (Wilson Committee) in 1975.

The Wilson Committee, which was the first of its kind in public sector audit and the first significant step in Macdonell's efforts to reform his office, reported in March 1975 that the main source of difficulties between the auditor-general and the executive while Henderson was auditor-general was a general lack of agreement over what the public sector auditor had a right to investigate. In the introductory passages of its report, the Wilson Committee came down decidedly on the side of Henderson and Macdonell and disagreed with those who would place a narrow legislative interpretation on Section 70(1) of the Financial Administration Act:

[T]his ... seems inconsistent with our understanding of Parliament's intention when it appropriates funds for a particular purpose. In making such an appropriation, it surely imposes a trust on the administration not only to use the funds for the specified purposes but, as a trustee, to spend the money prudently – that is, with a view to economy and efficiency. In other words, the administration is expected to ensure that value for money will be obtained' (Canadian auditor-general, 1975:33).

Drawing upon the experiences of the United States GAO, and other countries where public sector audit concerns went beyond purely accounting and legal procedures, the Wilson Committee advocated extending Henderson's approach and allowing the public sector auditor to move into value-for-money auditing (Canadian auditor-general, 1975:108). The Wilson Committee's support for a broader mandate was tempered by the realities which would confront the public sector auditor when it came time to make major incursions using value-for-money auditing. With considerable prescience, they pointed to the difficulties in developing measures of performance and the susceptibility of value-for-money auditors to accusations that, when seeking to comment upon management effectiveness, they were straying into the area of policy effectiveness which was politically off-limits to them. Value-for-money auditing, warned the committee,

...is complex and poses problems of judgement for the person making its evaluation. It encompasses three inter-related components: whether money is expended economically and efficiently and whether the program on which it is expended is effective in meeting its objectives. ... (Only) the first two components, economy and efficiency, are susceptible to reasonably objective definition ...' (Canadian auditor-general, 1975:33).

The success and breadth of change introduced in public sector audit by the Canadians in the early 1970s was the envy of Australian public sector auditors (Steele Craik, 1976:6). Indeed, Flesher and Zarzeski (2002:101) allude to how the Canadian experience was 'probably ... more influential than that of any other nation' for other Westminster auditors-general. David Lidbetter, a senior member of the Australian auditor-general's staff, in evidence before a parliamentary inquiry into public sector audit referred to the similarity between Australian and Canadian value-for-money auditing (JCPA 1986, Minutes of Evidence, 7 August: 247). Auditors-general Brigden and Taylor both used the Canadians as the model which they thought reforms to the independence of Australian public sector audit should emulate. Australian public sector audit, argued Taylor, should be 'brought into line' with the Canadians (Taylor, 1989:6). Soon after the Wilson Committee reported, the Australian auditor-general's office made a detailed study of the report's recommendations (AAO, 1975). Later, auditor-general Brigden urged Parliament that reforms similar to the Canadians were well overdue (AAO, 1984-5:3). Meanwhile in England, the British Public Accounts Committee in 1981 observed that 'the similarities between the issues discussed in ... (Canada and Australia) and those raised in evidence we have received (concerning British public sector audit) is striking' (quoted in Fielden, 1984:219).

5. Conclusion

This paper has established that the reasons for the apparent reluctance of Australia, New Zealand and England to follow the example of the US in value-for-money auditing are mainly to do with the different constitutional arrangements and conventions under which public sector auditors operate in Westminster and American governments. As much as Westminster auditors-general, including that of Canada, admired the work of the GAO, the sanctity of the right of the executive to govern without the intrusion of parliament once monies are appropriated was interpreted as sufficient to limit the compass of investigations and comments by auditors-general to the more easily ascertained legality and regularity of expenditures. Accordingly, prior to the late 20th century, the efficiency with which the executive in Westminster governments carried out the functions approved by parliament, or even whether these had been accomplished, was not an explicit consideration in the appropriation and audit processes. However professionally attractive the experiences of the GAO may have been to auditors-general in Westminster jurisdictions, until the latter decades of the 20th century when public sector management reforms created the demand for, and the conditions conducive to, audit reform,

the ability of Westminster auditors-general to assimilate new forms of accountability and to comment on management efficiency were circumscribed by constitutional conventions and the absence of clearly defined objectives for departments and programmes. Although similar constraints applied to Canada, the appointment of auditors-general from the private sector in concert with public sector management reforms provided an environment more conducive to audit reform and to the relaxation of Westminster conventions of government that had bound the activities of auditors-general for a century.

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The existence and independence of audit committees in France

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Abstract—This paper uses an agency theory framework to investigate the determinants of audit committees in France. Empirical tests address a cross-sectional sample of 285 listed companies for the fiscal year 1997, which is two years after the first Viénot report recommending the creation of audit committees among listed companies. Multivariate analyses show that the existence of an audit committee, and the committee's independence, are both negatively correlated with insider ownership, consistent with the owner-manager agency theory that considers audit committees as devices aimed at strengthening the monitoring system, the quality of financial reporting and the whole corporate governance environment. The existence of an audit committee that complies with corporate governance recommendations (i.e., a minimum of three directors, all of whom are non-executive directors) also positively depends on leverage if the firm has a high-IOS (Investment Opportunity Set). The quality of accounting numbers thus seems important in shareholder-debtholder relationships if lenders are potentially more exposed to default risk and expropriation mechanisms. However, this result might be sensitive to the IOS measurement and classification of high- and low-IOS companies. Finally, the presence of an audit committee is found to be positively correlated with board size, firm size, auditor reputation, and with the diversity of the company's operations.

1. Introduction

As can be seen in Anglo-American countries, audit committees have emerged as a significant component of the French corporate governance practices since the first Viénot Report (1995). The non-mandatory governance structures proposed were designed to enhance the monitoring role of the board of directors in the audit process. This measure followed several scandals arising from directors' failures to exercise their *duty of care* regarding financial reporting and internal control analysis (Thierry-Dubuisson, 1998).

This study tests the validity of agency theory predictions regarding: (1) the incentives of French companies to appoint an audit committee; and (2) the independence of these committees, which is supposed to reinforce their monitoring effectiveness.

The empirical work is based on a cross-sectional analysis of a large sample of French listed companies two years after the first Viénot Report, and the results are compared to those observed in Anglo-American environments.

The paper is organised into six sections. Section 2 outlines the creation and role of audit committees in France. Section 3 develops hypotheses about the determinants of the existence and independence of the audit committees. Section 4 focuses on the methodological aspects of the study, and Section 5 presents the empirical results. The final section summarises and compares our findings with those of other studies.

2. Audit committees in France

Anglo-American reports broadly define an audit committee as a sub-committee of the board of directors, composed of at least three non-executive directors, wherein the majority or the totality must be independent from the management of the company (Treadway, 1987; Cadbury, 1992). Bradbury (1990) specifies that audit committees should meet three objectives: (1) they should increase the credibility of audited financial statements; (2) they should assist the board in fulfilling responsibilities concerning the reliability of accounting reporting; and (3) finally they should protect the independence of internal and external auditors. Obviously, the monitoring effectiveness of audit committees is an important concern. The Treadway Report recommends that 'audit committees should be informed, vigilant and effective overseers of the financial reporting process and the company's in-

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ternal controls' (p.41). To this end, the exclusive presence of independent members and direct communication with internal and statutory auditors are necessary requirements.

With the exception of more detailed regulations governing internal control and auditing in financial institutions, French laws suggest only the possibility of creating specialised board committees. The 1967 decree with respect to business corporations states that a board of directors can confer on one or more of its members – and even on third parties for companies with CEOs and boards of directors¹ – mandates or missions for any specific objective. For this purpose, the board can create and organise sub-committees that would fall within its responsibility (Decree #67-236, articles 90 and 115).

In 1982, the Aubin Report on the future of the accounting profession and the 'Compagnie Nationale des Commissaires aux Comptes' (National Institute of Auditors), encouraged the use of audit committees in public companies, but with little effect. As recently as 1995, only a few large groups (SEITA, Schneider, Total, Alcatel) had an audit committee (Perucca, 1995). Changes could be seen after the Viénot Report (1995), which promoted three kinds of specialised committees: audit, nomination, and remuneration committees. Based on a review of 1995 annual reports, Vuchot Ward Howell (1996) observe that 29 of 40 firms that composed the CAC 40 index had created one or more specialised committees. Investigations from KPMG of the 250 largest market capitalisations on the Paris Stock Exchange (the SBF 250 index firms) report the existence of 50 audit committees in 1997 and 47 in 1998.² Richard and Bourdon (1999) indicate that all but four (Cap Gemini, Eridania-Béghin Say, Michelin and Peugeot) of the CAC 40 indexed companies had an audit committee in place by 1998.

However, an inquiry conducted by Arthur Andersen and the 'Institut Français de l'Audit et du Contrôle Interne' (French Institute of Internal Auditors) (1999) stresses the lack of independence within the internal audit departments, and the limited role of audit committees in actual practice. Specifically, audit committees have little influence on the hierarchical dependence of internal auditors, who still report to CEOs or CFOs (in 70% and 25% of the cases respectively), thus providing

these top executives with a decisive say over internal auditors' objectives. Furthermore, communication is found to be poor among internal auditors, external auditors, and the audit committee, and the information offered to the audit committee is at times incomplete. Finally, many audit committees are found to have little or no involvement in the audit planning procedures.

Thiéry-Dubuisson (1998) notes that if the French and American motivations seemed to be parallel, France nonetheless lagged 40 years behind the US with respect to the recommendations on the use of audit committees. This delay can be attributed to the legal liability of directors and to the distinctive characteristics of French capitalism: (1) there is less owner-manager separation; (2) there is significant historical State ownership; and (3) there are many cross-shareholdings that encourage indulgent attitudes to managers when the CEO of one company sits on the board of another company, and vice versa. As well, the second Viénot Report (1999) recommends only that one third of the audit committee be composed of independent directors, which is far less stringent than the Treadway and Cadbury recommendations of totality and majority respectively. In fact, only 36% of the 47 committees identified in the 1998 KPMG study have a majority of independent members, while 17% have no independent members at all, and 15% include top executives as members.

Lastly, communication from external auditors to the audit committee has been limited by the professional secrecy rule. External auditors must communicate directly with a company's legal representative (i.e., the President). Article 230 of the Companies Law authorises direct communication with the board of directors for important issues or problems, but that direct communication with one (or a group of) director(s) is not suitable for ethical reasons, and may engage auditors' criminal responsibility if the professional secrecy rule is violated. In response to this communication problem, the 1998 KPMG investigation indicates that a large majority of boards (66%) have unanimously relieved statutory auditors of their professional secrecy obligation with respect to the audit committee, but sometimes in exchange for an involvement of top executives in the committee's meetings, which may in fact interfere with corporate governance principles.

3. Hypotheses

Table 1 summarises the empirical results of major studies that have dealt with the determinants of audit committees.

Note that the use of audit committees is particularly low in New Zealand at 15% compared with the UK and US, which may in part be explained by

¹ French limited companies can use a two-tiered board organisation somewhat similar to the German one, with management and supervisory boards providing an explicit separation between the executive and monitoring decision making powers. The traditional and most common structure is the company with a 'Président-Directeur Général' and a board of directors, where the P-DG exercises both the functions of CEO and chairman of the board.

² Reported in *La Profession Comptable*, No. 192, January 1999, pp. 18–20.

Table 1
Empirical findings from previous studies on audit committee existence

Authors	Pincus et al. (1989)	Bradbury (1990)	Collier (1993)	Menon and Williams (1994)
Country	United States (NASDAQ)	New-Zealand	United Kingdom	United States (OTC market)
Sample size (year)	100 / 84 (1986) ^a	135 (1981)	142 (1990)	199 ^b (1986–87)
Number (%) of firms with an audit committee	68 (68.0%) / 52 (61.9%)	20 (14.8%)	89 (62.7%)	155 (77.9%)
Firm size (<i>Size</i>)				
Market value ^c	+	+ (10%) / + (ns)	– (ns)	– (ns)
Ln (<i>Total Assets</i>)	+			+ (ns)
Ownership				
% Officers & Directors	–	– (5%) / – (5%)		
% Directors	–		– (ns)	– (10%)
Ln (# outstanding shares)	+		+ (ns)	
ICTRL ^d (dummy)	+		+ (5%)	
Ln (# shareholders)	+			+ (ns)
% Managers	–			– (ns)
Leverage				
Long-Term Debt / Size	+	+ (10%) / + (5%)		+ (5%)
Total Liabilities / Size	+		+ (ns)	
Debt-To-Assets	+			+ (ns)
Assets-in-place				
Fixed Assets / Size	–		– (ns)	– (ns)
Board characteristics				
# Directors	+		+ (5%)	+ (ns)
# NEDs	+			+ (1%)
% of NEDs	+	+ (5%) / + (5%)		+ (1%)
Cumulative function of Chairman & CEO (dummy)	–			– (ns)
Auditor quality				
Big Eight, Big Six (dummy) ^e	+	+ (5%) / + (10%)	– (ns)	+ (ns) + (5%)
Model chi-square (d.o.f.)	39.17 / 30.10 (6)	17.76 (8)	n.c.	68.89 (7)
Correct predictions (%)	85.00 / 82.14	n.c.	73.24	n.c.

Abbreviations: # (number); Ln (natural log); ns (non-significant); n.c. (not communicated); d.o.f. (degrees of freedom); NED (Non-executive director)

Significance levels are indicated in parenthesis.

^a Results are reported for an initial random sample of 100 NASDAQ firms, and for the same sample after the elimination of 16 financial firms.

^b Random sample of 200 *over-the-counter* (OTC) firms minus one observation because of missing data.

^c Ln (market value of common equity + book value of preferred equity + book value of debt).

^d *Intercorporate Control:* dummy variable coded 1 if another firm holds a minimum of 10% of the voting rights and is represented on the board of directors.

^e *Big Six* for Collier (1993), *Big Eight* for other studies.

a cultural factor, specifically the negative connotation of such structures in New Zealand (Bradbury, 1990).³ The results surveyed differ somewhat from country to country. Common significant determinants can be found only to do with the board's characteristics (the number of directors, the weight of non-executive directors). Furthermore, agency cost predictors such as managerial ownership and leverage were found to be significantly associated with the presence of an audit committee for NASDAQ and UK firms.

3.1. Agency hypotheses

The studies referred to in Table 1 largely rely on the agency theory framework to explain the creation of audit committees. In this context, accounting numbers play a major social and contractual role in that they are used to monitor managers' actions, to reduce information asymmetries, and to define various contracts. In contrast with the Anglo-American corporate governance culture – which is more focused on the disciplinary power of market forces – the governance approach in continental Europe extends to the firm's stakeholders and may explain the demand for accounting by third parties other than shareholders or bondholders, and especially by private creditors that may wish to assess the firm's solvency. In general terms, accounting numbers are part of the contracting process aimed at regulating the distribution of the wealth created by the firm to its stakeholders (Charreaux, 2000).

The probability that managers will opportunistically manipulate accounting numbers increases in agency situations because of their higher discretionary powers and the limited visibility of their decisions. Consequently, there is a differential demand for monitoring and specifically for auditing services. A higher quality of the audit process can generally be expected to enhance the quality of financial reporting and to improve the governance of firms that are subject to high agency costs. In a cost-efficiency paradigm, firms will seek to minimise the sum of explicit monitoring expenses, including the differential cost of audit quality, together with implicit agency costs incurred by information asymmetries. As is usual in corporate governance studies, it is assumed that independence is a key condition for an audit committee to be able to provide effective monitoring, in the sense that independence generally denotes a higher level of scrutiny and integrity (Fama, 1980; Klein, 2002a). It is also assumed that there are costs associated with independence, either directly (i.e., the appointment of directors that possess au-

diting expertise), or indirectly (i.e., additional work demanded by the audit committee to the statutory or internal auditors).

An independent audit committee is intended to reduce information asymmetries between outside directors and auditors concerning the key accounting policies (e.g., contingencies, scope of consolidation). It is also dedicated to promote auditor's independence and arbitrate the conflicts between the auditor and managers. As such, the audit committee may contribute to the overall audit quality. Over the last 10 years, a growing body of academic research has stressed this contribution in terms of financial reporting and audit quality. In the US, the presence of an audit committee has been found to mitigate the occurrence of SEC enforcement actions, earning restatements and litigations (DeFond and Jiambalvo, 1991; McMullen, 1996; Dechow et al., 1996), as well as fraudulent financial reporting (Beasley et al., 2000). In the UK, Peasnell et al. (2000) document a greater ability of independent boards to monitor short-term earnings management when an audit committee exists. Audit committee independence, expertise and/or activity have also been highlighted as significant features in the prevention of SEC sanctions (Abbott et al., 2000) and discretionary accruals (Klein, 2002b; Xie et al., 2003; Chtourou et al., 2001). Finally, independent audit committees can be relevant devices to favour the emission of a going concern audit report (Carcello and Neal, 2000), to limit the extent of non-audit services provided by the external auditor (Abbott et al., 2003), to ease the appointment of an industry specialist auditor (Abbott and Parker, 2000), and to prevent opinion shopping (Lennox, 2002).

Agency costs of equity

The intensity of shareholder-manager conflicts is inversely related to managerial ownership (Jensen and Meckling, 1976). A low managerial ownership implies a higher probability that managers will take opportunistic actions and manipulate accounting numbers to satisfy their own interest. As a result, the demand for independent audit committees to support audit quality, and to reinforce the monitoring function in general, is likely to increase under the pressures from outside shareholders. Furthermore, the presence of significant or majority shareholders on the board – which is often the case in the French context of concentrated ownership –, may produce a direct monitoring and mitigate opportunistic actions by managers. In other words, substitution effects are possible between the monitoring power of shareholders and the demand for audit committees. Hence, a high insider ownership should increase the monitoring power of shareholders and make the presence of an audit committee unnecessary.

³ The sample year (1981) might equally explain the low proportion of audit committees observed in New Zealand.

Hypothesis 1: The probability that an audit committee exists, and whether the committee is independent, are negatively correlated with insider ownership *ceteris paribus*.

Agency costs of debt

Jensen and Meckling (1976), and others, explain that agency costs between shareholders and debtholders increase with leverage. Haka and Chalos (1990) argue that current debt ratios are likely to affect the cost of future debt financing because debtholders will adjust their risk premiums according to their perception of solvency and default risk. An effective audit committee should point out to managers and auditors (both internal and external) the financial reporting consequences of strategic and business risks (e.g., review of contingencies, relevance of depreciation methods), and thus should reduce the probability of default by improved risk control. Practitioners consider this risk monitoring function as one of the main duties of the audit committee. PricewaterhouseCoopers (1999), for instance, states that the audit committee is responsible for reviewing the 'adequacy of the company's internal control and risk management systems'. A survey of US audit committees by Ernst & Young (2002) reports that '86% of audit committees (or their equivalents) are receiving regular updates on key enterprise risk from management. Likewise, 74% of audit committees are reviewing risk management processes'. Therefore, an independent audit committee should be able to provide more awareness of the default risk, and thus should mitigate the costs of debt financing associated with an increase in leverage.

Hypothesis 2: The probability that an audit committee exists, and whether the committee is independent, are positively correlated with leverage *ceteris paribus*.

Leverage itself may not be a source of conflict between shareholders and debtholders if the risk assumed by the latter remains low. Indeed, many firms are able to sustain relatively high leverage ratios without presenting risky investments for lenders. Debtholders' risks may increase significantly, however, in the following three situations. First, if the firm operates an inherently risky business and has important cash-flow variability, then the probability that it will experience difficulties in meeting its debt payments is higher when compared to similarly leveraged companies with more regular cash-flows. Second, if the firm's assets-in-place are specific and cannot serve as collateral for creditors (Williamson, 1988), the probability that

debtholders will recover their claims in the case of bankruptcy and liquidation is reduced. Third, if the firm has growth options that provide shareholders and managers with a larger set of opportunistic choices to operate wealth transfers – e.g., sub-optimal investment decisions such as asset substitution (Galai and Masulis, 1976) or underinvestment (Myers, 1977) –, then debtholders are more exposed to an expropriation.

These three risk components are positively associated with the concept of Investment Opportunity Set (IOS hereinafter), which can be defined as the value of options to make positive Net Present Value investments (Kallapur and Trombley, 2001). Gaver and Gaver (1993) specify that a valuable IOS is not confined to growth firms, and can also characterise well-established companies that maintain significant advantages in their ability to exploit emerging opportunities. Therefore, if the value of a firm's IOS is largely determined by the availability of future investment opportunities or growth options, it also depends on the nature of discretionary investments made by managers up to the present time. Given that growth options can be priced as calls on real assets, their value is an increasing function of the cash-flow variability associated with these underlying assets (Myers, 1977; Kester, 1984). In addition, discretionary and firm-specific investments in physical and human capital (R&D, specific knowledge, etc.) may also provide valuable investment options through patents and other exclusive rights, and thus contribute to the firm's IOS (Smith and Watts, 1992). Therefore, high-IOS companies should be characterised by valuable growth options, cash-flow variability, and asset specificity and these three risk factors imply more extensive shareholder-debtholder agency conflicts if the firm's leverage increases.

Debtholders who invest in high-IOS companies will in return demand greater guarantees regarding the value of the firm's assets-in-place, its liabilities, engagements and contingencies when making their evaluations. They are also more likely to impose accounting-based debt covenants⁴ – e.g., maximum dividend and leverage ratios, investment and merger limitations regarding risky businesses, etc. – in order to mitigate opportunistic wealth transfers. These monitoring devices imply a higher reliance on accounting numbers by debtholders of high-IOS companies, and could encourage the formation of an independent audit committee to review managers' accounting policies and to supervise the audit process quality. Hence, the IOS is hypothesised to be a conditioning factor of specific shareholder-debtholder agency costs associated with leverage. Therefore, there should be a differential demand for audit quality (i.e., for independent audit committees) associated with leverage if the firm has a high IOS.

⁴ The practice of accounting-based debt covenants is common in Anglo-American debt contracts. It is also found in the European bond markets, and in private debt contracts in France (Coulombe and Tondeur, 2001).

Hypothesis 3: The probability that an audit committee exists, and whether the committee is independent, increase with leverage in high-IOS companies *ceteris paribus*.

3.2. Other predictors

Investment opportunity set

Bradbury (1990) and Collier (1993) hypothesise that the presence of an audit committee is less likely if the firm's value is mainly composed of assets-in-place (vs. growth options), because wealth transfers between shareholders and debtholders are more difficult. However, their logistic models document a negative but insignificant relationship between the presence of an audit committee and the ratio of fixed assets to the firm's market value. Elsewhere, Skinner (1993) explains that the use of accounting numbers for contracting purposes should decrease as the IOS increases, because accounting numbers are a poor reflection of the underlying economic reality of high-IOS firms. Consequently, the demand for auditing and for audit committees should also diminish as the firm's IOS increases, implying a negative correlation between the presence or independence of an audit committee and the IOS variable. Deli and Gillan (2000), and Klein (2002a), find that growth options negatively affect the probability that the firm appoints a completely independent audit committee. Hence, given these conflicting concepts, we do not formally anticipate a directional impact of the IOS on the presence or independence of an audit committee.

Board characteristics

The characteristics of a board as an institutional monitoring device are likely to affect the optimal audit quality. Two competing arguments have been advanced in the literature. The first assumes that monitoring mechanisms are substitutable, which suggests that effective monitoring of managerial decisions by the board would imply a lesser demand for audit quality. The second argument assumes that monitoring mechanisms complement each other, i.e., that non-executive directors (NEDs) provide a more effective means of monitoring managers, and that they support the creation of specialised committees of which they can be a part, in order to obtain greater assurances about the risk of fraudulent financial reporting. A board's effectiveness to monitor top executives largely depends on the separation of functions between directors and managers. In the French context, this can be seen through the institutional organisation, the size, and the independence of the board.

Institutional organisation. The two-tiered board organisation structure would suggest a clearer separation of functions between management and monitoring. The supervisory board examines quar-

terly activity reports and authorises significant and strategic decisions (property and subsidiary disposals, off-balance sheet guaranties given to stakeholders, etc.) while fulfilling its monitoring duties without involving itself in management decisions. The Viénot 2 Report (1999) notes that this dual structure is only observed for 2–3% of French limited companies, but has been adopted by approximately 20% of the CAC 40 index firms. Collier and Gregory (1996) specify that the common two-tiered board organisation found in Germany and the Netherlands may explain the weak development of audit committees in these countries. Thus, audit committees could be less widespread among companies that have supervisory boards.

The relationship (if any) between audit committees' independence and the two-tiered board structures is more ambiguous. The status and mission of supervisory boards (vs. traditional boards) might suggest that firms with a dual organisational structure would favour independent directors and independent audit committees, but substitution effects at this level imply that two-tiered board firms in fact have less independent audit committees. Thus, we do not anticipate directional effects between audit committees' independence and the adoption of a two-tiered board structure.

Board size. Large, inefficient boards can justify the existence of smaller, more specialised committees. Bradbury (1990) notes that the delegation of duties by the board to sub-committees requires a sufficient number of directors; he reports a positive correlation between the number of directors and the probability that an audit committee has been formed.

Independent directors. If audit committees provide an effective way of reducing information asymmetries between executive and non-executive directors, one can anticipate that the latter will pressure the company to form such a committee (Collier, 1993). In addition, Menon and Williams (1994) argue that a higher percentage of outsiders on the board can be associated with an increasing use of mechanisms that monitor management. Hence, a higher proportion of independent directors on the board is likely to favour the creation of an independent audit committee. The presence of an audit committee is significantly associated with the percentage of NEDs on the board for US firms (Pincus et al., 1989; Menon and Williams, 1994), and the number of NEDs in the UK (Collier, 1993). A positive relationship is also reported between audit committee and board independence in Canada (Beasley and Salterio, 2001) and in the US (Klein, 2002a).

Firm size

Most of the costs associated with the operation of monitoring devices are fixed, and this provides large firms with economies of scale (Simunic,

1980; Anderson et al., 1993). Pincus et al. (1989) conclude that the benefits gained from an efficient monitoring device increase with firm size, which should motivate large organisations to create independent audit committees. Moreover, the need to mitigate the political and social costs borne by large companies may also explain an increased demand for monitoring. Large firms should be more willing to comply with corporate governance principles, especially regarding the matter of independence.

Auditor reputation

Big audit firms⁵ are likely to pressure their clients into forming audit committees for three main reasons: (1) to maintain audit quality and protect their brand name capital; (2) to dilute their liability in case of an audit failure; and (3) to support institutional compliance with corporate governance principles. The second argument specifically addresses high-litigation environments such as is the case in the US;⁶ it is of little relevance in the French context as the litigation risk for auditors is quite low, and because audit committee members have no specific exposure to liability. According to corporate law, the board of directors remains liable as a whole in legal proceedings with respect to financial reporting issues. Thus, institutional compliance might be the prevalent motivation in France, along with a possible commitment to promote audit quality. The Big Firms generally propose the creation of audit committees so as to comply with corporate governance recommendations (see for instance PricewaterhouseCoopers, 1999). Hence, they are hypothesised to promote the appointment of independent audit committees.

Complexity

Industry diversification increases the complexity of audit engagement (Simunic, 1980). Firms with diversified operations must implement reporting systems and define internal control procedures in accordance with the economic requirements of each activity. Braiotta et al. (1999, p.15) state that 'the planning function of the audit committee should include [...] a review and consolidation of the audit plans of the internal and external auditing groups'. The Committee on Corporate Governance (1998, section D.3.2) adds: 'The duties of the audit committee should include keeping under review the scope and results of the audit and its cost effectiveness and the independence and objectivity of the auditors'. Therefore, an audit committee can be an effective device to co-ordinate the efforts of internal and external auditors with respect to internal control analysis.⁷ More complex organisations are consequently expected to benefit from an audit committee.

Regulation and institutional pressures

Companies listed on foreign stock markets must comply with the requirements of local securities exchanges. In addition, they have a greater exposure to foreign institutional investors, who are increasingly stringent regarding the application of corporate governance principles. As a result, board composition is regularly reviewed, and the pressure to appoint specialised committees with effective monitoring powers may be higher. Thus, firms listed on foreign stock markets are expected to have an increased incentive to create an audit committee and to promote its independence.

Figure 1 provides an overview of the formal model that will be empirically tested below.

4. Data and methodology

4.1. Sample selection

The sample is composed of French listed companies disclosing consolidated financial statements,⁸ that had data available for the fiscal year ending between April 1997 and March 1998, and for the four previous years in the Disclosure/Worldscope CD-ROM. This timeframe was necessary in order to compute the risk variables defined below. After three firms were eliminated because of negative common equity (which is incompatible with the computation of market-to-book ratios), the final sample comprises 285 firms.

Of the annual reports studied, the presence of an audit committee is mentioned in 50 of the sample firms (17.5%). Some committees, however, did not comply with corporate governance recommendations, and thus might be less capable of exercising effective monitoring. Audit committees have been classified as 'non-compliant' if they had less

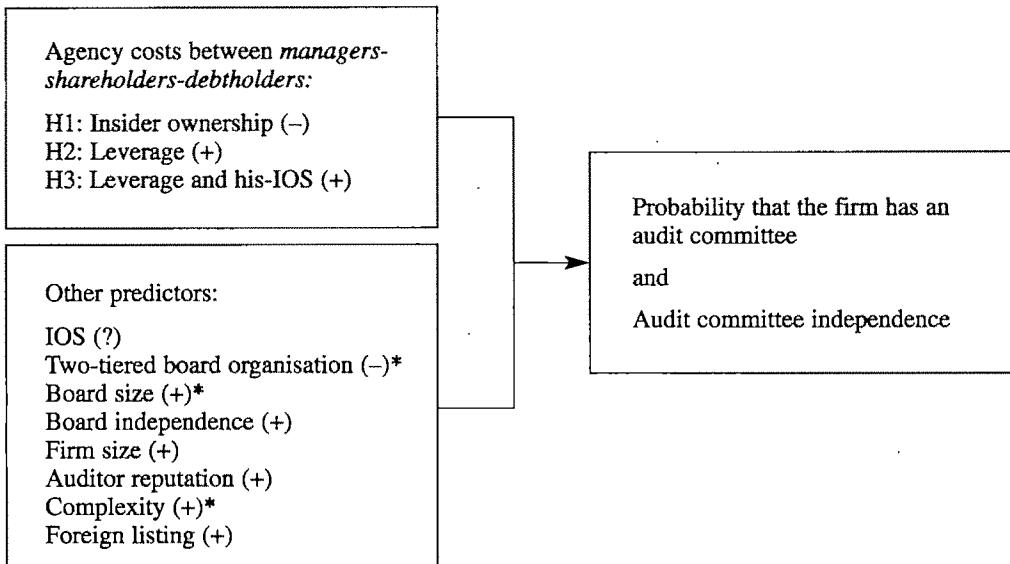
⁵ Because of mergers among the Big audit firms, the Big Eight, Big Six or even Big Five are referred to as 'Big Firms' throughout the text.

⁶ On the AMEX, over the period of 1973–1980, Eichenseher and Shields (1985) observe that the creation of an audit committee after an auditor change is more likely for firms that appoint a Big Eight auditor. Given that the Big Eight are known to provide more solvency guarantees in the event of litigation, and that liability is often shared with directors and/or the audit committee, they argue that a mutual interest, consisting in the division of potential damages, exists between audit committees and Big audit firms.

⁷ However, this argument is somewhat limited by professional standards and the principle that statutory auditors remain fully responsible for their opinion regardless of their reliance on work performed by internal auditors.

⁸ The selection is limited to consolidated statements for homogeneity reasons concerning accounting and auditing regulations. Companies that are required to disclose consolidated financial statements must appoint at least two co-auditors. Financial, insurance, and real estate firms are excluded because of their specific accounting environment and audit regulation.

Figure 1
Formal model of audit committee presence and independence



*Anticipated impact limited to the existence of audit committees.

than three members, or if one or more member was an executive.⁹ This treatment resulted in the elimination of four companies out of the 50 where the members' identities were missing or were not detailed enough to allow reliable classification. Nineteen committees were classified as non-compliant, including seven with only two members. The sample of compliant committees is then composed of 27 observations out of 281 (9.6%). Table 2 provides the breakdown of the samples according to firm industries and the existence of audit committees. Exact independence tests reveal that there are no contingencies between the industry and audit committee distributions. In both cases, the null hypothesis of independence between industry membership and existence of an audit committee is not rejected at conventional statistical levels.

4.2. Variables

Dependent variables

Dependent variables characterise the existence and independence of audit committees. Hence, AUDCOM is coded 1 if the firm mentions the existence of an audit committee in its annual report, and 0 otherwise. Similarly, AUDCOM2 is coded 1 if the firm has a compliant audit committee ac-

cording to its annual report, and 0 otherwise. This results in considering non-compliant audit committees as non-existing structures (AUDCOM2 = 0).

We also consider three measurements of audit committees' independence based on previous studies: (1) INMEMB is the proportion of independent members sitting on the committee; (2) INDCOM is coded 1 if the committee is composed exclusively of independent members and 0 otherwise; and (3) NEDCOM is coded 1 if the committee is composed exclusively of NEDs and 0 otherwise.¹⁰ NEDCOM is an intermediate approach of independence, less restrictive than INDCOM in the sense that 'grey' or 'affiliate' directors, although NEDs, cannot be classified as purely independent. 'Grey' directors are usually significant shareholders not involved in the management of the company, former and retired managers, or business relationships (attorneys, lawyers, suppliers, etc.). Table 3 provides descriptive statistics relating to the audit committee sample.

Independent variables

Agency costs of equity. The agency costs of equity are inversely proxied by insider ownership (INSIDERS), i.e., the proportional ownership held by managers, directors and staff members as mentioned in the annual report. Despite information asymmetries between managers and outside directors (NEDs), board responsibilities with respect to published financial statements assumed that directors are, at least, concerned with private information about accounting policies. Elsewhere,

⁹ Menon and Williams (1994) reject audit committees if they have less than three members, if they include executive members, or if they meet less than once a year. The number of meetings is useful to measure diligence, but this information was disclosed by only a small number of the sample firms.

¹⁰ INMEMB and INDCOM are used by Klein (2002a), and NEDCOM by Menon and Williams (1994).

Table 2
Audit committee and industry distributions

Industry (DAFSA classification)	Total sample		Firms with an Audit committee		Sample	Firms with a compliant audit committee ^a	
	N	%	N	%		N	%
1. Food and agriculture	24	8.4	3	12.5	24	2	8.3
2. Buildings and public authorities	12	4.2	5	41.7	11	2	18.2
3. Consumer goods	32	11.2	4	12.5	32	2	6.3
4. Chemistry	14	4.9	3	21.4	14	2	14.3
5. Communication	14	4.9	1	7.1	14	0	0.0
6. Distribution, retail	39	13.7	5	12.8	39	2	5.1
7. Energy and water	9	3.2	3	33.3	9	3	33.3
8. High technologies	27	9.5	7	25.9	26	5	19.2
9. Holding and portfolio firms	11	3.9	1	9.1	11	0	0.0
10. Primary and raw industries	10	3.5	2	20.0	10	1	10.0
11. Transformation industries	59	20.7	9	15.3	59	6	10.2
12. Raw materials	5	1.8	0	0.0	5	0	0.0
13. Services	19	6.7	6	31.6	18	2	11.1
14. Transport and auxiliaries	10	3.5	1	10.0	9	0	0.0
Total	285	100	50	17.5	281	27	9.6
Exact p-value ^b				0.285			0.268

^a Committees with a minimum of three members, and no member in charge of executive functions in the company, one of its subsidiaries or a shareholder owning more than 20% of the shares.

^b H0: the industry and audit committee distributions are independent. The low frequency in many cells implies that the distributions do not meet the asymptotic requirements for chi-square tests. Thus, we computed exact p-values using the StatXact-5® software. For the first table (N=285), computation time is too long and exceeds memory capacities: an estimation of the exact p-value is reported using a Monte Carlo simulation of one million tables sampled (the 99.90% confidence interval being [0.283; 0.286]). Asymptotic p-values are of the same order.

Table 3
Descriptive statistics about audit committee size and independence

Audit committee characteristics	N ^a	Mean	Median	Minimum	Maximum	Std dev.
Number of members	49	3.43	3.00	2	7	1.21
Number of independent members ^b	46	2.46	2.00	0	6	1.24
Proportion of independent members (%)	46	74.65	92.86	0.00	100.00	0.30
Number of NEDs ^c	46	2.93	3.00	0	6	1.18
Proportion of NEDs (%)	46	87.32	100.00	0.00	100.00	0.23
SAADA (1998) ^d						
Number of members	13	3.08	3.00	2	5	0.73
Proportion of outside members (%)	13	81.15	80.00	50.00	100.00	0.19

^a One of the 50 companies did not report the size of its audit committee, and three other companies provided insufficient information to operate a reliable classification of audit committee members.

^b Independent directors are defined as directors : (1) without executive function in the firm, its subsidiaries or significant shareholders, (2) free of any significant shareholder involvement (less than 5% of the shares), and (3) not representing another company which is a significant shareholder.

^c Non-executive director: director without any executive function in the company, its subsidiaries, and shareholders owning more than 20% of the shares (a noticeable influence is assumed over the 20% threshold).

^d Study carried out in January 1997 with 23 non-financial companies who had formed an audit committee at that time. However, the composition information for the committee was available for only 13 firms.

employees are somewhat involved in the reporting process through the Council of Workers, which can appoint a chartered accountant to examine the financial situation and specific operations, and which can interview statutory auditors.

Leverage. Leverage is measured using the Long-Term-Debt-to-Total-Assets (LTDTA) ratio, calculated as follows with references to *Worldscope* items between brackets:

$$LTDTA = \frac{LT\ debt [3251]}{total\ assets [2999]}$$

This ratio is intended to capture the potential magnitude of shareholder-debtholder agency conflicts. The numerator refers to debt contracts payable at one year maturity or greater as this purportedly requires increased monitoring devices (such as covenants) than easily renegotiable short-term credits.¹¹ The denominator is the book value of total assets; this aggregate is preferred to estimates of the firm's market value in the present agency context. Formally, the market value of assets-in-place represents the maximum guarantee debtholders have in the case of liquidation. Using the firm's market value as the denominator would include a growth option component that cannot guarantee debtholders' claims, and would therefore underestimate the extent of shareholder-debtholder conflicts in connection with assets valuation and covenants breaches.¹²

Investment opportunity set. More difficult to measure is the firm's IOS. Gaver and Gaver (1993, p.133) state that 'the IOS is inherently unobservable and is likely to be imperfectly measured by any single empirical proxy'. The literature shows no consensus on singular IOS proxies. Market-to-book ratios capture growth options but may involve significant measurement errors for firms that have long-lived assets, as the book value is the historical cost less depreciation (Smith and Watts,

¹¹ In high-IOS firms, it is less risky for debtholders to operate on a short-term basis. Accordingly, Myers (1977) states that firms with important growth opportunities should exhibit a higher proportion of short-term debt in their overall debt financing.

¹² Inversely, however, the LTDTA ratio may overestimate agency conflicts because the accounting conservatism probably underestimates the value of assets-in-place.

¹³ Gaver and Gaver (1993) define their IOS index with the Common Factor Analysis of six variables: (1) MBVA, (2) MBVE, (3) R&D expenses/total assets, (4) earning-to-price ratio, (5) RISK2, and (6) the number of appearances of the firm in growth mutual funds.

¹⁴ We compute MBVE and MBVA using the average high/low stock price for fiscal year 1997 in order to reduce time asynchronies for firms whose yearend is not December 31st (38 of 285 firms), and also to mitigate the market trend bias at the end of 1997.

¹⁵ Relying on this assumption, Chung and Charoenwong (1991) formally demonstrate, and empirically document, that the greater the portion of a stock's market value accounted for by growth options, the higher the firm's systematic risk.

1992). Therefore, given that individual IOS proxies are, in theory, positively correlated to each other but only partially associated with the IOS concept, factor analysis seems a relevant methodological approach to reduce the measurement errors of those individual proxies.¹³

We use Principal Component Analysis to extract an IOS index from four singular variables: the Market-to-Book Value of Equity (MBVE), the Market-to-Book Value of Assets (MBVA),¹⁴ an estimate of operating risk (RISK1) and an estimate of total risk (RISK2). Market-to-book ratios are calculated as follows [*Worldscope* item]:

$$MBVE = \frac{\frac{average\ price\ high - low^*}{common\ shares\ outstanding [5001]}}{common\ equity [3501]}$$

$$MBVA = \frac{\frac{total\ assets [2999] - common\ equity [3501] + average\ price\ high - low^*}{common\ share\ outstanding [5001]}}{total\ assets [2999]}$$

The risk variables are defined as the standard deviation, over the last four years, of the change in return-on-assets for RISK1, and of the return-on-market-value for RISK2:

$$RISK1 = \sigma \left[\frac{\Delta \text{operating income} [1250]_t}{\text{total assets} [2999]_{t-1}} \right], \text{ for } t = -4 \text{ to } 0$$

$$RISK2 = \sigma \left[\frac{\Delta (\text{common shares outstanding} [5001] * \text{closing price} [5301])_t + \text{interest expenses on debt} [1251]_t + \text{cash dividend paid} [4551]_t}{(\text{total assets} [2999] - \text{common equity} [3501] + \text{closing price} [5301] * \text{common shares outstanding} [5001])_{t-1}} \right], \\ \text{for } t = -4 \text{ to } 0$$

The simultaneous use of market-to-book and ex post variance indicators is consistent with the positive relationship between the value of growth options and the risk of underlying assets, if we assume that the firm remains in the same business risk class (i.e., future investment opportunities have the same risk as those of the existing assets).¹⁵ The factorisation then covers two of the three factors postulated to affect debtholders' risk, i.e., growth options and cash-flow variability. A proxy for asset specificity such as the commonly used R&D intensity could not be considered as the information about R&D expenses was available for only 92 firms. The factor analysis is specified without rotation, for the 285 firms of the sample. The IOS index is obtained by the following linear combination, which represents the weightings of the singular variables on the first component:

$$IOS = 0.439\ MBVE^* + 0.470\ MBVA^* + 0.096\ RISK1^* + 0.331\ RISK2^*$$

where * denotes the normalised value of each sin-

gular variable. This first component, with an eigenvalue of 1.879, explains 46.97% of the total variance and gives a good representation of market-to-book ratios and total risk (correlations of MBVE, MBVA, RISK1 and RISK2 with the IOS factor are of 0.826, 0.882, 0.181 and 0.621 respectively).

Specific shareholder-debtholder agency costs. The specific agency costs of debt in high-IOS companies are captured with an interaction term (HiIOS-LTDTA) that replicates the value of LTDTA if the firm's IOS index is greater than or equal to the median of the total sample (N=285), and is set to zero otherwise. This specification is the most relevant to account for the conditional effects the IOS may have on the breadth of agency conflicts associated with leverage (LTDTA). Indeed, the IOS itself is not appropriate to capture shareholder-debtholder conflicts (high-IOS companies with no debt do not support any shareholder-debtholder agency costs), and leverage must remain the proxy of interest. A shortcoming of such an interaction term is that the proposed classification of high and low-IOS companies, according to the median IOS index, is somewhat arbitrary. Robustness tests with alternative classifications are discussed in a sensitivity analysis.

Board characteristics. Three variables account for board characteristics. DUAL is an indicator variable of two-tiered board firms, coded 1 if the firm has a supervisory board and 0 otherwise. NBDIR designates the number of directors on the board whatever its institutional nature, and INDIR is the proportion of independent directors on the board. Given the lack of an operational definition,¹⁶ the identification of independent directors deserves explanation. A director has been classified as independent if s/he meets the following two conditions:

1. S/he is neither in charge of an executive mandate, nor has responsibilities within the company, its group, or one of its significant shareholders (owning at least 5% of the shares

¹⁶ The second Viénot Report merely provides a general definition (1999:14): 'a director is independent from the firm's management if he does not maintain any relationship, whatever the nature, with the firm or its group which could compromise the exercise of its freedom of judgement.' [Author's translation].

¹⁷ The Viénot Report is not explicit on this point as it states that independent directors should not be a significant shareholder of the company or for any of its subsidiaries.

¹⁸ Traditionally, Herfindahl indexes are used in marketing to assess the competitive intensity for a given product. In this context, S_i designates the market share of the i th company.

¹⁹ The Pricewaterhouse / Coopers & Lybrand merger was not completed for fiscal years ended in 1997 or early 1998. For this time period, we refer to the Big Six on the French market: Barbier Frinault (French member of Arthur Andersen), Coopers & Lybrand, Deloitte & Touche, KPMG, PriceWaterhouse and Ernst & Young.

or voting rights). This rule also applies to natural persons who represent other companies on the board. In addition, to account for personal and family links, directors who have the same surname as one of the firm's officers have not been considered to be independent,

2. S/he is not a significant shareholder in that s/he does not own more than 5% of the shares or voting rights of the company. At values of over 5%, the ownership link is postulated to be significant enough to compromise the independence of judgment.¹⁷

An independent director of a given company can hold other board responsibilities in subsidiaries or in the firms being significant shareholders of the company. The director remains independent as long as s/he respects the above conditions for each office. Elsewhere, directors who are executives for the firms of minority shareholders of the company (less than 5%) are considered independent because they purportedly have a greater incentive to monitor and actively preserve minority interests.

Firm size. The production function of auditing and monitoring services assumes economies of scale in that the average quantity of auditing services per assets is a decreasing function of those assets. Thus, measurement of the existing assets according to their book value seems more relevant than one based on the firm's market capitalisation to capture the size effect associated with the economies of scale incentive. Market capitalisation includes goodwill (or badwill) dimension, which is out of the scope of an audit (Roy, 1996). We use the natural log transformation of the book value of total assets (LnASSETS) to proxy for firm size.

Complexity. Organisational complexity is inversely proxied by an Herfindahl index (HERF) calculated according to the activity breakdown of consolidated sales (see Chan et al., 1993). $HERF = S_1^2 + S_2^2 \dots + S_n^2$ where S_i is the proportion of sales generated by the i th activity segment. This variable takes the value of 1 for a single-activity firm, and converges to $1/n$ for a company that is equally diversified across n activity segments. HERF operates as a sales concentration index that minimises the weight of marginal activities, and this is consistent with the materiality principle in auditing.¹⁸ This information is collected in annual reports and when sales breakdowns are not disclosed, and no other indication allows for consideration of the firm as a single activity, then the data is considered to be missing.

Auditor reputation. Auditor reputation is characterised by a dummy variable. BIG6 is coded 1 if at least one of the statutory auditors belongs to the Big Audit Firms, and 0 otherwise.¹⁹ This classification is operated according to the signature of au-

ditors' report on consolidated financial statements.

Regulation and institutional pressure. Additional pressures emerging from the presence on foreign capital markets are captured with the dummy variable LIST which is coded 1 if the firm is listed on a foreign stock market (stocks or ADRs), and 0 otherwise.

5. Empirical results

5.1. The presence of audit committees

Table 4 provides univariate tests which compare firms that have audit committees with those that do not. Panel A addresses continuous variables (*t*-test), Panel B examines dummies (chi-square test), and Panel C shows leverage after a sample breakdown according to the median IOS value (*t*-test and Mann-Whitney *u*-test).

The differences found in Panel A are consistent with our predictions and are generally highly significant. Firms with audit committees, either compliant or not, have less insider ownership, higher leverage, have a larger size and board of directors, have more diversified operations (a lower HERF), and have more independent boards than firms without audit committees ($p < 0.001$ except for LTDTA).

Firms with (compliant) audit committees have significantly higher long-term-debt ratios at the 1% (5%) confidence level. However, the results in Panel C suggest that these significant differences are driven by high-IOS companies; they remain weak and insignificant for low-IOS companies, specifically when the comparison focuses on compliant audit committees. The differences for the IOS index are positive but statistically insignificant.²⁰ Therefore, it seems important to consider the interaction term of leverage and IOS to capture the agency costs between shareholders and debtholders. As observed, the existence of an audit committee does not seem to be associated with leverage as long as the firm has a low IOS.

The chi-square tests in Panel B do not support a link between the choice of a two-tiered board organisation (DUAL) and the existence of an audit committee. Nonetheless, they suggest an association between audit committees and Big audit firms: 86% (89%) of the firms with (compliant)

audit committees are audited by at least one Big Firm, versus only 49% (52%) of firms without an audit committee ($p < 0.01$). Such contingencies are also observed by Pincus et al. (1989) and Collier (1993) for NASDAQ and UK firms. Moreover, chi-square tests show that the proportion of firms listed on a foreign stock market is significantly higher for those with audit committee at 44% compared to only 3.4% for firms without audit committees.

A multivariate analysis is required to test for the marginal contribution of each predictor in the likelihood that an audit committee exists. Table 5 provides the correlation matrix between the exogenous variables.

Significant correlations mainly involve firm size (LnASSETS) with INSIDERS (-0.397), HERF (-0.327), NBDIR (0.597), BIG6 (0.305) and LIST (0.542). Importantly, the usual but high correlation between firm size and board size can be problematic. As firm size is an important determinant of board size, we regress NBDIR on LnASSETS and use the residuals from this regression (noted NBDIR_RES) – uncorrelated with LnASSETS by construction – to account for the marginal effects of board size on the presence of an audit committee. The estimated OLS regression is $NBDIR = 1.194 \cdot \text{LnASSETS} - 8.969$ (adjusted R-square = 0.354). The use of NBDIR_RES, instead of NBDIR, also results in much lower correlations with other exogenous variables (see Table 5).

Table 6 reports the LOGIT maximum likelihood estimates of the following AUDCOM (AUDCOM2) models, which predict the existence of (compliant) audit committees:

$$\begin{aligned} \text{AUDCOM}_i \text{ or AUDCOM2}_i = & \beta_0 + \\ & \beta_1 \text{INSIDERS}_i + \beta_2 \text{LTDTA}_i + \\ & \beta_3 \text{HiIOS-LTDTA}_i + \beta_4 \text{IOS}_i + \\ & \beta_5 \text{LnASSETS}_i + \beta_6 \text{HERF}_i + \\ & \beta_7 \text{NBDIR_RES}_i + \beta_8 \text{INDIR}_i + \\ & \beta_9 \text{DUAL}_i + \beta_{10} \text{BIG6}_i + \beta_{11} \text{LIST}_i + \epsilon \end{aligned}$$

To control for the potential confounding effects of the strong correlation between LTDTA and HiIOS-LTDTA (0.573), the models are replicated eliminating alternatively both predictors. Hence, regressions 1 and 4 designate the complete AUDCOM and AUDCOM2 models, whereas LTDTA is omitted in regressions 2 and 5, and HiIOS-LTDTA is omitted in regressions 3 and 6.

Negative coefficients on INSIDERS support hypothesis H1 at the 0.05 and 0.01 confidence levels for AUDCOM and AUDCOM2 respectively. Thus, the appointment of an audit committee may be a response to mitigate agency problems between the firm and outside shareholders, either by preventing

²⁰ One could argue that if leverage is low, shareholder-debtholder agency costs are not important and debtholders show greater tolerance for the IOS with respect to the level of audit quality. This indirect approach suggests that the relation between audit committees and the IOS could differ according to leverage. To investigate this possibility, we run further univariate tests on the IOS variable after having partitioned the sample according to the median LTDTA value. All the differences in means are insignificant, suggesting that the presence of an audit committee is not associated with the IOS, whatever the firm's leverage. I thank an anonymous reviewer for this suggestion.

Table 4
Univariate tests for audit committee existence

Variables	Sign Yes – No	Total sample (N=285)		Presence of an audit committee		Presence of a compliant audit committee ^c	
		Yes (N=50)	No (N=235)	Mean Diff. (t-stat)	Yes (N=27)	No (N=254)	Mean Diff. (t-stat)
Panel A: Continuous variables							
INSIDERS	–	0.6061 [0.6200]	0.4013 [0.4061]	0.6497 [0.6610] –0.2484 [–7.295]***	0.3003 [0.2450]	0.6390 [0.6454]	-0.3387 [–8.791]***
LTDIA	+	0.1157 [0.1011]	0.1506 [0.1305]	0.1083 [0.0921] 0.0423 [2.834]***	0.1545 [0.1299]	0.1110 [0.0954]	0.0435 [2.179]**
IOS	?	0.0000 [–0.3504]	0.1439 [–0.1073]	–0.0306 [–0.3806] 0.1745 [1.149]	0.2698 [–0.1739]	–0.0238 [–0.3660]	0.2936 [1.290]
LNASSETS	+	14.651 [14.325]	16.891 [16.708]	14.175 [13.908] 2.716 [11.522]***	17.346 [17.728]	14.342 [14.034]	3.005 [9.368]***
HERF ^a	–	0.5719 [0.5288]	0.3988 [0.3299]	0.6135 [0.5446] –0.2146 [–6.974]***	0.3502 [0.3040]	0.5978 [0.5372]	-0.2476 [–6.84]***
NBDIR	+	8.52 [8.00]	12.62 [12.00]	7.65 [7.00] 4.97 [9.256]***	13.07 [12.00]	7.95 [7.00]	5.12 [6.676]***
INDDR ^b	+	0.4134 [0.4000]	0.5193 [0.5455]	0.3905 [0.3750] 0.2354 0.2049	0.5824 [0.5917] 0.2036	0.3964 [0.3846] 0.2325	0.1860 [4.366]***

Table 4
Univariate tests for audit committee existence (continued)

		Presence of a compliant audit committee				Presence of an audit committee				Significance			
		Total sample (N=285)		Yes (N=50)		No (N=235)		Yes (N=27)		No (N=254)		Mean Diff. (Chi-square)	
Variables	Sign Yes - No												
Panel B: Dummy variables													
DUAL	-	0.2140	224	0.2600	37	0.2043	187	0.0557	19	0.2047	202	0.0916 (1.22)	
DUreq. = 0		61	13		48			(0.76)	8		52		
Freq. = 1													
BIG6	+	0.5579	126	0.8600	7	0.4936	119	0.3664	3	0.5197	122	0.3692 (13.47)***	
BIreq. = 0		159	43		116			(22.44)***	24				
Freq. = 1													
LIST	+	0.1053	255	0.4400	28	0.0340	227	0.4060	15	0.0669	237	0.3775 (37.58)***	
Frreq. = 0			30		22			(72.14)***	12		17		
Freq. = 1													
Panel C: Leverage interacted with IOS													
IOS ≥ median													
LTTDA	+	0.1169	[0.1035]	0.1553	[0.1312]	0.1054	[0.0828]	0.0498	[0.1312]	0.1720	[0.0898]	0.0642 (2.459)***	
		0.0996		0.0967		0.0980		(2.588)***	0.1073		0.0956	(2.645)***	
IOS < median													
LTTDA	?	0.1144	[0.0998]	0.1414	[0.1299]	0.1108	[0.0974]	0.0307	[0.1228]	0.1128	[0.1272]	-0.0011 (-0.047)	
		0.0924		0.0973		0.0915						[0.1323]	0.0946 (0.422)

Table 4
Univariate tests for audit committee existence (continued)

Panel A reports descriptive statistics – mean, [median] and standard deviation – for the ‘total’, ‘yes’ and ‘no’ subsamples. The test columns indicate the difference in mean and the *t*-test for independent samples in parentheses.

Panel B reports the mean value and 2x2 contingency table for dummies. The test columns indicate the difference in mean and result of the chi-square independence test in parentheses.

* , ** and *** denote significance at $p < 0.10$, 0.05 and 0.01 respectively (two-tailed tests).

^a Due to missing data, 253 observations are available for HERF (49 and 204 for companies with and without an audit committee, respectively).

^b Due to missing data, 275 observations are available for INDIR (49 and 226 for companies with and without an audit committee, respectively).

^c Tests about compliant audit committees comprise 281 companies (and not 285) because four companies provided insufficient information to reliably determine the compliance of their audit committee.

Panel C reports descriptive statistics – mean, [median] and standard deviation – for the ‘total’, ‘yes’ and ‘no’ subsamples after a sample breakdown according to the median IOS index. The test columns indicate the difference in mean, and results of the *t*-test (*t*-stat) and Mann-Whitney *u*-test (*z*-stat) for independent samples.

* , ** and *** denote significance at $p < 0.10$, 0.05 and 0.01 respectively (two-tailed tests).

Variables definition:

INSIDERS = ownership proportion of officers, directors and staff members

LTD_{TA} = Long-Term-Debt-to-Total-Assets ratio

IOS = 0.439.MBVE* + 0.470.MBVA* + 0.096.RISK1* + 0.331.RISK2*, with * denoting the normalised value of:

MBVE = Market-to-Book Value of common Equity

MBVA = Market-to-Book Value of total Assets

RISK1 = standard deviation, over the last four years, of the change in return-on-assets

RISK2 = standard deviation, over the last four years, of the return-on-market-value

LnASSETS = natural log transformation of total assets

HERF = Herfindahl index according to the activity breakdown of net consolidated sales

NBDIR = number of directors on the board

INDIR = proportion of independent directors

DUAL = dummy coded 1 if the firm has a two-tiered board structure, and 0 otherwise

BIG6 = dummy coded 1 if the firm is audited by one Big Six auditor at least, and 0 otherwise

LIST = dummy coded 1 if the firm has its shares listed on a foreign stock market, and 0 otherwise

Table 5
Pearson correlation matrix of exogenous variables

	<i>HLOS</i>	<i>LTDTA</i>	<i>IOS</i>	<i>LnASSETS</i>	<i>HERF</i>	<i>NBDIR</i>	<i>NBDIR</i> <i>_RES</i>	<i>INDIR</i>	<i>DUAL</i>	<i>BIG6</i>
<i>LTDTA</i>	-0.099									
<i>HLOS-LDTA</i>	-0.192**	0.573***								
<i>IOS</i>	-0.089	-0.032	0.369***							
<i>LnASSETS</i>	-0.397***	0.216***	0.174**	0.015						
<i>HERF</i>	0.322***	-0.199**	-0.197**	-0.017	-0.327***					
<i>NBDIR</i>	-0.294***	0.146*	0.098	-0.099	0.597***	-0.321***				
<i>NBDIR_RES</i>	-0.072	0.022	-0.008	-0.134*	0.000	-0.161*	0.802			
<i>INDIR</i>	-0.335***	0.106	0.139*	-0.025	0.258***	-0.199***	0.315***	0.199***		
<i>DUAL</i>	-0.163**	0.042	0.122*	0.040	0.086	-0.019	-0.124*	-0.219***	0.212***	
<i>BIG6</i>	-0.136*	0.081	0.134*	0.127*	0.305***	-0.150*	0.161**	-0.026	0.174**	0.034
<i>LST</i>	-0.379***	0.200***	0.203***	0.021	0.542***	-0.217***	0.417***	0.117*	0.269***	0.072
										0.259***

* , ** and *** denote significance at p<0.05, 0.01 and 0.001 respectively (two-tailed tests).
Variables definition: see Table 6.

Table 6
Multivariate analysis of audit committee existence

		Dependent variable = AUDCOM			Dependent variable = AUDCOM2		
	Exp.Sign	1	2	3	4	5	6
INTERCEPT		-10.801 (-3.485)***	-10.874 (-3.492)***	-10.703 (-3.455)***	-17.736 (-3.017)***	-18.275 (-3.062)***	-16.985 (-3.063)***
INSIDERS	-	-2.757 (-2.102)**	-2.791 (-2.136)**	-2.698 (-2.089)**	-6.116 (-2.930)***	-5.917 (-2.907)***	-5.609 (-2.862)***
LTDIA	+	-2.376 (-0.687)	0.747 (0.323)	0.747 (0.323)	-5.127 (-1.039)	-5.127 (-1.039)	1.495 (0.434)
HIOS-LTDTA	+	4.095 (1.208)	2.327 (1.071)	2.327 (1.071)	9.182 (1.858)*	9.182 (1.858)*	5.359 (1.773)*
IOS	?	0.167 (0.663)	0.224 (0.941)	0.294 (1.292)	0.464 (1.328)	0.571 (1.716)*	0.672 (2.075)**
LnASSETS	+	0.762 (4.143)***	0.750 (4.120)***	0.736 (4.106)***	1.178 (3.389)***	1.174 (3.374)***	1.097 (3.405)***
HERF	-	-3.410 (-2.733)***	-3.273 (-2.682)***	-3.293 (-2.696)***	-3.764 (-2.124)***	-3.553 (-2.057)***	-3.636 (-2.118)***
NBDIR_RES	+	0.305 (3.547)***	0.302 (3.534)***	0.298 (3.546)***	0.261 (2.185)**	0.251 (2.133)**	0.245 (2.130)**
INDIR	+	-1.146 (-0.853)	-1.060 (-0.794)	-1.002 (-0.748)	2.301 (1.115)	2.437 (1.192)	2.271 (1.155)
DUAL	-	0.555 (0.859)	0.548 (0.852)	0.630 (0.992)	-0.184 (-0.205)	-0.150 (-0.172)	0.180 (0.216)
BIG6	+	1.073 (1.878)*	1.082 (1.889)*	1.137 (2.003)**	0.065 (0.074)	0.083 (0.094)	0.250 (0.288)

Table 6
Multivariate analysis of audit committee existence (continued)

LOGIT regressions: $AUDCOM_i$ or $AUDCOM_i = \beta_0 + \beta_1 INSIDERS_i + \beta_2 LTDTA_i + \beta_3 HIOS-LTDTA_i + \beta_4 IOS_i + \beta_5 LnASSETS_i + \beta_6 HERF_i + \beta_7 NBDIR_RES_i + \beta_8 NNDIR_i + \beta_9 DUAL_i + \beta_{10} BIG6_i + \beta_{11} LIST_i + \epsilon$

Exp.Sign		Dependent variable = AUDCOM			Dependent variable = AUDCOM2		
		1	2	3	4	5	6
LIST	+	0.538 (0.819)	0.491 (0.756)	0.541 (0.826)	-2.061 (-1.868)*	-2.195 (-1.978)**	-2.041 (-1.914)*
Chi-Square	n	117.87***	117.39***	116.39***	92.29***	91.14***	88.41***
Correct predictions		90.2%	91.0%	94.6%	95.0%	95.0%	
N		244	244	244	240	240	240

The Table reports regressions coefficients and t-statistics in parenthesis. *, ** and *** indicate significance at p<0.10, 0.05 and 0.01 respectively (two-tailed tests).

Variables definition:

AUDCOM = dummy variable coded 1 if the firm indicates the existence of an audit committee in the annual report, and 0 otherwise

AUDCOM2 = dummy variable coded 1 if the firm indicates the existence of a compliant audit committee (at least three members who are not engaged in executives functions) in the annual report, and 0 otherwise

INSIDERS = ownership proportion of officers, directors and staff members

LTDTA = Long-Term-Debt-to-Total-Assets ratio

HIOS-LTDTA = LTDTA if the firm's IOS index is greater than or equal to the median IOS of the total sample, and 0 otherwise
 $IOS = 0.439.MBVE^* + 0.470.MBVA^* + 0.096.RISK1^* + 0.331.RISK2^*$, with * denoting the normalised value of the Market-to-Book Value of common Equity (MBVE), the Market-to-Book Value of total Assets (MBVA), the standard deviation over the last four years of the change in return-on-assets (RISK1), and the standard deviation over the last four years of the return-on-market-value (RISK2)

LnASSETS = natural log of the firm's total assets

HERF = Herfindahl index according to the activity breakdown of net consolidated sales

NBDIR_RES = residuals from the OLS regression of the number of directors (NBDIR) on firm size (LnASSETS)

INDIR = proportion of independent directors

DUAL = dummy coded 1 if the firm has a two-tiered board structure, and 0 otherwise

BIG6 = dummy coded 1 if the firm is audited by one Big Six auditor at least, and 0 otherwise

LIST = dummy coded 1 if the firm has its shares listed on a foreign stock market, and 0 otherwise

managers' opportunistic behaviours or enhancing the quality of financial reporting. Similar results are reported in Anglo-American environments (NASDAQ and UK, see Table 1), where outsider ownership is usually more extensive.

However, non-significant coefficients on LTDTA are inconsistent with H2 and Anglo-American results.²¹ Leverage alone does not affect the existence of an audit committee. It may be that the LTDTA ratio itself poorly reflects the real extent of shareholder-debtholder conflicts. The interaction term of leverage and IOS provides some insight on that point: HiIOS-LTDTA significantly affects the existence of a compliant audit committee, consistent with H3 at $p<0.10$ (two-tailed). Therefore, if a high-IOS justifies an increased monitoring of accounting numbers given the increased risk supported by debtholders, an effective audit committee may contribute to a more efficient governance of contractual relationships between the firm and its debtholders. Note that the IOS index is marginally positive but insignificant in the complete AUDCOM and AUDCOM2 models, but becomes significant if the interaction term is omitted ($p<0.05$, model 6). This is consistent with the agency-monitoring hypothesis found in Bradbury (1990) and Collier (1993) – who predict a negative effect of the ratio of assets-in-place on the presence of an audit committee – and is in contradiction with the argument that the usefulness of accounting numbers is poor for growth firms. Therefore, the interaction term in model 4 suggests two interpretations. First, compliant audit committees are valuable monitoring devices for debtholders in high-IOS firms: they probably contribute to the prevention of opportunism and to the quality of accounting numbers. Second, the demand for monitoring may be more effectively predicted if leverage is interacted with the firm's IOS.

Board size has significant and positive marginal effects (NBDIR_RES) on the probability that an audit committee exists, which confirms that small boards have less incentive to delegate functions to sub-committees for efficiency purposes. However, non-significant coefficients for the proportion of independent directors (INDIR) contrasts with Anglo-American studies, and may indicate the relatively weak power of independent directors in the French corporate governance system, possibly explained by the poor recognition of their roles and

functions. Elsewhere, firm size also positively affects the presence of an audit committee ($p<0.01$ in all the models). This is consistent with economies of scale and/or political cost assumptions with respect to the demand for monitoring devices. In addition to the overall complexity dimension accounted for by firm size, negative coefficients on HERF may reflect a specific demand to review internal control procedures and to co-ordinate the audit effort in firms with diversified operations. Finally, auditor reputation increases the probability that an audit committee exists; however, the significance of the BIG6 dummy does not continue when the models focus on compliant committees. Hence, this finding does not confirm the position taken by the Big Firms to support the corporate governance recommendations in the creation of audit committees.

5.2. The independence of audit committees

Mann-Whitney U-tests were performed to compare firms with an audit committee exclusively composed of NEDs or independent directors, and firms where the audit committee does not meet these criteria. Untabulated results indicate significant differences for the INSIDERS variable ($p<0.01$). Firms with a 100% independent audit committee, or with a committee that is composed exclusively of NEDs, have less insider ownership than others (the differences in mean/median values are 18/26 percentage points for the 100% independence criterion, and 19/25 percentage points for the NEDs criterion). As well, firms with a 100% independent audit committee exhibit a higher proportion of independent directors ($p<0.10$, two-tailed), but this test is not significant for the NEDs criterion.

Regressions of the independence of audit committees rely on the OLS procedure for the proportion of independent members (INMEMB), and on LOGIT estimates for binary dependent variables (NEDCOM or INDCOM). Results are reported in Table 7 for the following model:

$$\begin{aligned} INMEMB_i \text{ or } INDCOM_i \text{ or } NEDCOM_i = & \beta_0 + \\ & \beta_1 INSIDERS_i + \beta_2 LTDTA_i + \\ & \beta_3 HiIOS-LTDTA_i + \beta_4 IOS_i + \\ & \beta_5 LnASSETS_i + \beta_6 INDIR_i + \\ & \beta_7 DUAL_i + \beta_8 BIG6_i + \beta_9 LIST_i + \epsilon \end{aligned}$$

²¹ One possible explanation is that these studies refer to debt ratios using the firm's market value, instead of the book value, of total assets as denominator. Hence, the LOGIT models were re-estimated using a similar long-term debt ratio, i.e., scaled by (total assets – common equity + average price high/low*common shares outstanding). The results are unchanged. The interaction term (debt x IOS) significantly explains the existence of a compliant audit committee, and the leverage ratio itself is not significant.

All the models display a negative and significant coefficient on INSIDERS and thus support H1 at $p<0.10$ (two-tailed). Conversely, no significant relationship is observed between an audit committee's independence and the leverage variables. The small sample size, confounding effects, or measurement errors concerning the identification of in-

Table 7
Multivariate analysis of audit committee independence

		OLS (LOGIT) regressions for dependent variables INMEMB (NEDCOM or INDCOM); INMEMB _i or INDCOM _i or NEDCOM _i = $\beta_0 + \beta_1 INSIDERS_i + \beta_2 LTDTA_i + \beta_3 HIOS-LTDTA_i + \beta_4 IOS_i + \beta_5 LnASSETS_i + \beta_6 LnIOS-LTDTA_i + \beta_7 INDIR_i + \beta_8 DUAL_i + \beta_9 BIG6_i + \beta_{10} LIST_i + \epsilon$	
		Dependent variable INDCOM	
		Dependent variable NEDCOM	
Exp. sign		β	t -statistic
INMEMB	INDCOM	β	t -statistic
INTERCEPT		0.149	-15.913
INSIDERS	-	-0.430	-1.807*
LTDIA	+	0.258	0.437
HIOS-LTDTA	+	-0.173	-0.317
IOS	?	0.075	1.404
LnASSETS	+	0.035	0.845
INDIR	+	0.605	2.417**
DUAL	?	-0.090	-0.863
BIG6	+	-0.145	-0.984
LIST	+	-0.091	-0.887
Adjusted/Pseudo R2		0.255	0.639
F-stat/chi-square		2.67**	27.21****
Correct predictions (%)	N	NA	86.7
	N	45	45

*, ** and *** indicate significance at p<0.10, 0.05 and 0.01 (two-tailed tests).

Variables definition:

INMEMB = proportion of independent members on the audit committee

NEDCOM = dummy variable coded 1 if the audit committee comprises only Non-Executive Directors (NEDs), and 0 otherwise

INDCOM = dummy variable coded 1 if the audit committee comprises 100% of independent members, and 0 otherwise

INSIDERS = ownership proportion of officers, directors and staff members

LTDIA = Long-Term-Debt-to-Total-Assets ratio

HIOS-LTDTA = LTDTA if the firm's IOS index is greater than or equal to the median IOS of the total sample, and 0 otherwise

IOS = 0.439.MBVE* + 0.470.MBVA* + 0.096.RISK1* + 0.331.RISK2*, with * denoting the normalised value of the Market-to-Book Value of common Equity (MBVE), the Market-to-Book Value of total Assets (MBVA), the standard deviation over the last four years of the change in return-on-assets (RISK1), and the standard deviation over the last four years of the return-on-market-value (RISK2)

LnASSETS = natural log of the firm's total assets

INDIR = proportion of independent directors

DUAL = dummy coded 1 if the firm has a two-tiered board structure, and 0 otherwise

BIG6 = dummy coded 1 if the firm is audited by one Big Six auditor at least, and 0 otherwise

LIST = dummy coded 1 if the firm has its shares listed on a foreign stock market, and 0 otherwise

dependent directors may explain these results. Untabulated results show that the NEDCOM model is somewhat sensitive to the alternative elimination of leverage variables: HiIOS-LTDTA becomes positive and significant at $p<0.05$ when LTDTA is excluded and, inversely, LTDTA is positive and significant at $p<0.10$ when HiIOS-LTDTA is excluded. Such sensitivity is not observed for the INMEMB and INDCOM models, which consider the more restrictive approach of audit committees' independence.

These non-significant results may also be due to the definition of dependent variables, which do not account for the affiliation of audit committee members. Indeed, agency conflicts can be mitigated by appointing representatives from debtholders to the audit committee, assuming that such representatives exist among directors. This issue is not specifically addressed here. Finally, the audit committee's independence is found to be positively associated with the proportion of independent directors on the board, either in the OLS and LOGIT regressions ($p<0.05$ and 0.10 respectively), whereas this complementarity is not observed for the exclusive presence of NEDs on the audit committee.

5.3. Sensitivity analyses

The IOS measurement

Kallapur and Trombley (1999) report that market-to-book ratios exhibit the highest correlation to realised growth. Assuming that the present IOS should eventually lead to realised growth in terms of assets-in-place or revenues within a three to five year period, they conclude that market-to-book ratios are the most powerful proxies for the IOS. Hence, we replicate the analysis by substituting the commonly used Market-to-Book-Value of Assets (MBVA) for the IOS factor index. Univariate tests provide similar results: significantly higher LTDTA for high-MBVA firms having an audit committee vs. high-MBVA firms without an audit committee, and non-significant differences in LTDTA for low-MBVA companies. However, the interaction term based on the median MBVA value (HiMBVA-LTDTA) is not significant in the AUDCOM2 model, the other coefficients being qualitatively unchanged. Thus, the reported results for H3 are sensitive to the choice of the IOS proxy, and the variability measures introduced in the IOS index may convey some meaningful information with respect to shareholder-debtholder conflicts.

The classification of high and low-IOS companies

Considering the median IOS value may affect the significance of the HiIOS-LTDTA term. Firms with an IOS index in the 40–60% percentiles are more likely to be misclassified. The AUDCOM and AUDCOM2 models are robust when re-esti-

mated after the elimination of these observations. However, the AUDCOM2 model is not robust when firms in the 30–70% percentiles are excluded: HiIOS-LTDTA is no longer significant and IOS becomes positive at $p<0.10$. Therefore, the results for H3 might be sensitive to the classification of high- and low-IOS companies.

Firms with non-compliant audit committees

The analysis of compliant audit committees combines the absence of an audit committee with the existence of a non-compliant one, and thus assumes that non-compliant audit committees do not contribute to the monitoring function. Univariate tests (not reported) show that firms with a non-compliant audit committee have more insider ownership, have lower board independence, and have lower total assets than firms with a compliant committee. Nevertheless, differences in leverage remain insignificant, even for partitioned high- and low-IOS samples. Thus, we eliminate the 19 firms that have a non-compliant audit committee and re-estimate the AUDCOM2 model. The resulting coefficients are qualitatively unchanged, suggesting that non-compliant audit committees have no significant monitoring contribution to mitigate shareholder-debtholder conflicts in high-IOS situations.

Multicollinearity effects

The important correlation between LnASSETS and LIST (0.542), as well as the significant correlations of both variables with other exogenous predictors (see Table 5), may introduce multicollinearity and bias the results. We thus re-estimate the models omitting LnASSETS and LIST alternatively. With respect to the presence of audit committees, the elimination of LnASSETS or LIST has two marginal effects: (1) the significance of BIG6 rises at $p<0.05$ in the AUDCOM model, and (2) board size (NBDIR_RES) exhibits lower significance ($p<0.10$) in the AUDCOM2 model. Furthermore, LIST becomes positive in the AUDCOM model ($p<0.001$) and insignificant in the AUDCOM2 one when firm size is omitted. Additionally, we run these models using the OLS procedure: the highest Variance Inflation Factor is about 2 and concerns HiIOS-LTDTA. If we remove LTDTA from the models, the maximum VIF decreases to 1.6, which is a fairly acceptable value. With respect to the independence models, excluding LnASSETS or LIST reinforces the significance of INSIDERS ($p<0.05$). In addition, the omission of LIST renders LnASSETS insignificant and BIG6 negative at $p<0.10$ in the NEDCOM model; and the omission of LnASSETS makes LIST insignificant in the INDCOM model. The other results are qualitatively the same. Hence, the multicollinearity problem is not likely to affect our conclusions.

Industry effects

The independence tests in Table 2 do not suggest an association between the existence of an audit committee and the firm's industry. Complementary investigations of industry effects are performed by re-estimating the AUDCOM and AUDCOM2 models with the simultaneous introduction of 13 indicator variables, to capture the industry membership of each company. The results are unchanged and none of the industry dummies are significant at the 0.10 statistical level.

6. Conclusion

This paper extends the empirical literature on the demand for audit committees to the French context. From an agency theory perspective, we investigate the existence and independence of audit committees as disclosed in the 1997 annual reports for a cross-sectional sample of listed companies, two years after the Viénot Report (1995) which includes the first significant recommendations in favour of the creation of audit committees.

The main findings provide some insight into the potential role that agency factors have played in the developments of audit committees in France. First, multivariate analyses document that the probability that a firm has an audit committee, as well as the committee's independence, are both negatively correlated with insider ownership. This finding is similar to those observed in Anglo-American environments, where the managerial model is culturally more widespread than in continental Europe, and is consistent with the shareholder-manager agency theory. Audit committees are thus viewed as monitoring devices used to prevent opportunistic behaviours and strengthen the quality of financial reporting, so as to mitigate agency conflicts between the preparers of financial statements and outside shareholders. In the French context, the demand for independent audit committees when insider ownership decreases may also compensate for the strong influence managers have on the audit process of publicly traded companies.

Second, logistic models show that the likelihood that an audit committee exists and that it complies with corporate governance recommendations (i.e., a minimum of three directors, all of them being NEDs) is marginally positively associated with leverage only if the firm has a high-IOS. This interactive approach builds on previous research. It is based on the assumption that shareholder-debtholder agency costs are specifically higher in high-IOS companies, and conversely that contracting mechanisms such as collateral guarantees on assets-in-place efficiently minimise the execution costs of debt contracts in low-IOS companies. In this context, the quality of accounting numbers would seem to be important in shareholder-

debtholder relationships if the debtholders are potentially more exposed to default risk and expropriation mechanisms. However, this result may be sensitive to the IOS measurement and to the classification of high- and low-IOS companies operated.

Furthermore, we find that the existence of an audit committee is positively correlated with board size, firm size, auditor reputation, and with the diversity of the firm's operations. However, the significance of auditor reputation collapses when the analysis is restricted to audit committees established in compliance with corporate governance principles. Finally, board independence is not found to explain the existence of an audit committee, contrary to US research findings. This might be explained by the cultural differences between the French and American corporate governance models, in that France is a less litigious environment and there is a lack of consideration for independent directors. However, we do observe a positive relation between audit committee independence and board independence.

The use of cross-sectional data may make our results and statistical interpretations period-specific. As a matter of fact, virtually all audit committees were created in the 1995–1997 period and therefore, it is quite likely that the ownership, leverage, and IOS characteristics of companies were already in place at the time of creation. Hence, one may reasonably assume that an institutional factor, materialised by the first Viénot Report, was predominant in the development of audit committees in France. What our analysis suggests, the inherent limitations of a cross-sectional approach acknowledged, is that agency considerations have played a role in decisions to establish audit committees and to comply with corporate governance recommendations, once these recommendations have received institutional support.

To statistically appreciate the period-specificity of the results, a replication of this study using more recent data would be required, notably after the second Viénot Report in July 1999. However, enquiries observe that the formation of board subcommittees tended to reach maturity between 1997 and 1998, and that this decision was not usually made on a short-term basis within public companies. Hence, further fruitful research may investigate the specific cases of companies that did not renew their audit committee, or could focus on the composition of audit committees with respect to the more recent US recommendations on financial literacy.

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Conflict, collaboration, fuzzy jurisdictions and partial settlements. Accountants, lawyers and insolvency practice during the late 19th century

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Abstract—Inter-professional conflict over insolvency work in Victorian England and Wales is often considered a formative instance of jurisdictional competition between accountants and lawyers. The paper explores this episode in the context of Abbott's theory of *The System of Professions*. It is shown that the Bankruptcy Act, 1869 disturbed inter-professional relations and unleashed competition between accountants and lawyers for insolvency work. However, the resultant hostility was substantially conducted through the professional media and did not engage unified occupational communities. In everyday practice accountants and lawyers maintained relations of mutual dependency rather than conflict. Some elements of a jurisdictional settlement between accountants and lawyers over bankruptcy work was achieved during the 1870s and 1880s through an intellectual division of labour, judicial decision making and organisational change. However, these forms of settlement seldom proved conclusive and statutory changes effectively perpetuated inter-professional competition for insolvency work into the 20th century.

1. Introduction

Of the many interfaces between accountants and other professionals, that with lawyers has attracted the particular attention of the accounting academy. During the 1990s a number of works explored this compelling inter-professional arena from contemporary and historical perspectives (Martens and McEnroe, 1991; Bromwich and Hopwood, 1992; Freedman and Power, 1992; Dezelay and Sugarmann, 1995; Walton, 1993; Napier, 1998). Edited volumes reported on the manifold dimensions of the conjunctions between accountants and lawyers in relation to knowledge, practice, regulation, the interposition of state agencies and the distribution of professional power. A specific focus was the potential impact of globalisation and inter-disciplinarity on reconfiguring the boundaries between the two professions.

Recent scholarship has shown that relationships between accountants and lawyers are complex; they are competitive but may also be co-operative. The current paper seeks to extend our understanding of inter-professional relations by exploring these themes during the late 19th century. At this

time the occupational boundaries between accountants and lawyers were disputed and a vitriolic discourse emerged as a result. Accountants were establishing a presence in the professional firmament in Victorian England. In doing so they collided with the established vocation of solicitor. Discord focused in particular on competition for insolvency work. Law journals warned of 'The Perils of Accountants'. Accountants were labelled as 'charlatans' and 'Intruders in the Law' (*Law Magazine*, 17.9.1870:367; 1.10.1870:385; 26.11.1870:66). Yet, behind these public displays of hostility lay relations of mutual co-operation between the two professions.

The foremost framework for analysing inter-professional conflict is Abbott's theory of professional jurisdictions. Abbott himself offered an historical exploration of the shifting work boundaries between lawyers and accountants in Britain. The remainder of this section presents a résumé of Abbott's thesis, identifies how his work has informed previous accounting research and how it defines the structure of the present contribution.

1.1. Abbott's system of professions

Andrew Abbott's *The System of Professions* (1988) offers a compelling analysis of professional behaviour. Abbott argues that traditional studies of professionalisation, with their focus on single occupations and organisational structures, are misplaced. He contends that this approach 'has plagued the professions literature for decades' (316). Rather, analyses should centre on inter-profession-

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al competition for the control of work (1–2, 18–19, 112). Work, after all, is the core concern of professionals. Historical studies of professions should, therefore, focus on occupational disputes over work (314): 'We need histories of jurisdictions who served them, where they came from, how the market was created, how conflict changed participants. The most important subjects for such investigations will be understudied professions like accounting and psychology' (325).

For Abbott, professions constitute part of 'an interdependent system' in which groups seek to protect and extend their respective jurisdictions. Jurisdiction comprises 'the link between a profession and its work' (1988:20). The boundaries between jurisdictions are contestable and shifting and their patterns shape professional institutions: 'Thus an effective historical sociology of professions must begin with case studies of jurisdictions and jurisdictional disputes' (2). Given the interactive nature of the system of professions, factors which disturb the distribution of work necessarily impact on the jurisdictions of other groups and disputes over the control of work ensue. Jurisdictional conflicts may be settled (temporarily stabilised) in a number of ways. These range from full control of tasks by a single profession to divisions of labour between the combatants. In most instances a jurisdiction is held by a single profession. However, in some cases individual professions can achieve occupancy of more than one jurisdiction and multiple tenancy of a single jurisdiction may exist (89).

Abbott illustrates the working of his system of professions by reference to three case studies. Accountants appear in two of these: the information professions, and lawyers and their competitors. Of particular significance to the current study is Abbott's survey of the inter-professional competition involving lawyers from 1880 to 1940 and their loss of jurisdiction. Abbott shows that the expanding field of business advice in the industrial economy was available for capture by solicitors and was contested by the emerging profession of accountants. The ensuing inter-professional conflict was resolved as 'an uneasy truce' (1988:24–25). Abbott based his case study on primary sources relating to lawyers' complaints of invasion by other professions. He concluded that the solicitor profession in England was structurally unable to ex-

pand to accommodate the increased demand for business services.¹ Hence, this field was ripe for invasion by other professions, particularly accountants (248–254).

Abbott's thesis has informed a number of studies of the accountancy profession. Dezalay (1991) performed a comparative investigation of accountants and lawyers' jurisdictions in the context of internationalisation and multidisciplinary partnerships. Sikka and Willmott (1995) used Abbott to reveal the way in which the accountancy profession has emphasised the ideology of independence to protect and extend its jurisdiction since the 1970s. Maltby (1999) enlisted Abbott to explain the capture of corporate auditing by professional accountants in late 19th century Britain. Pong (1999) analysed a skirmish between accountants and lawyers over the Accounting Standards Committee's exposure drafts on off-balance sheet finance during the 1980s. Martens and McEnroe (1998) utilised Abbott's framework to examine conflict between the Auditing Standards Board and lawyers in the US over the promulgation of Statement on Auditing Standards No. 72. Mills and Young (1999) refer to Abbott in their paper on the role of US courts in configuring the jurisdiction of CPAs and intra-professional competition in accountancy. Richardson (2002) used Abbott to inform his study of the dominance of financial accounting over management accounting in Canada, 1926–1986. As discussed later, most of these commentators have discovered limitations to Abbott's theory.

Abbott suggests that his theory be tested by reference to historical case studies (1988:30–31). The current investigation focuses primarily on the inter-professional conflict between lawyers and accountants in what Abbott defines as the 'business affairs' jurisdiction (257–258). It follows his approach by analysing a specific problem area of work, in this case bankruptcy, and the groups engaged in competition for its capture (267). Whereas the profession under assault – the lawyers – generated the sources used in Abbott's empirical analysis of lawyers and accountants, this study utilises a combination of published and archival evidence relating to both belligerents and, given its key role in this episode, the state. The period examined is bounded by legislative developments which successively disturbed inter-professional relations, comprised an element in their settlement and offered quasi regulation of the jurisdiction. These were the Bankruptcy Acts of 1869 and 1883. The paper is therefore mainly concerned with the period immediately preceding Abbott's own analysis of 1880–1940.

As Abbott shows, the achievement of exclusive practice rights and the promotion of jurisdictional claims involve the professions in persuading pub-

¹ The assertion that demand for legal services exceeded the supply of solicitors is disputable. By the end of the 19th century commentators were arguing that the legal profession was over- rather than under-stocked as aspirant parents crowded sons into the professions (Walker, 1988:64–66). Sugarman (1996:107, 110) refers to concerns about oversupply among solicitors and high rates of bankruptcy among them (*Law Times*, 7.10.1871:401, 3.2.1883: 362, 13.9.1884:339; *Accountant*, 22.1.1881:5; 24.9.1881:11).

lic opinion and the legal system. This was particularly the case during the 19th century (1988:69). By using professional journals, parliamentary records and legal proceedings the sources examined here reflect these dimensions of professional behaviour. The study recognises that reactions to jurisdictional disturbances, inter occupational conflicts and the formulation of settlements are also considered behind the closed doors of professional organisations. The minutes of the Law Society and accountants' organisations extant during the 1870s were therefore consulted.

Abbott's thesis points to three key, broadly chronological, stages in conflicts over professional work and their resolution: 'disturbances, jurisdictional contests, and the transformation leading to balance' (1988:215). These stages form the organising frame for the historical analysis which follows. The first stage concerns the disturbance of existing inter-professional relations.

2. Disturbance

In Abbott's theory, disturbances to the system of professions may be external or internal (1988:91–96). Within the system chains of disturbance can be activated when emergent groups on the 'paraprofessional periphery' invade a jurisdiction or when an established profession seeks to extend its territory on the basis of new knowledge or the acquisition of professional attributes (95–98). Abbott considers that two primary exogenous sources of disturbances have created and closed jurisdictions over the last two centuries. The first is the growth of large-scale organisations. For example, in relation to accountants he argues that large-scale organisations created work through the need to manage, report and audit. Hence, the advance of the joint stock company created the jurisdiction of accountants during the late 19th century. The administration of corporate failure also created a demand for accountants. As the rate of failure declined, accountants ventured into other territories, particularly audit (94, 101). The second exogenous source of disturbance is technological change. One example given by Abbott is the way in which the invention of calculating machines transformed the position of cost accountants (144–146).

It should be noted that there are a number of problems with Abbott's analysis relating of accountants. First his causality is simplistic. In particular, he ignores the role of the state in creating the legislative frameworks during the 1840s and 50s that facilitated the emergence of professional organisations and opened jurisdictions for accountants. Second, his discussion of business failure makes no distinction between bankruptcy and corporate liquidation. Third, Abbott underplays the significance of statutory changes, especially in

relation to bankruptcy, which reflected shifting ideologies about the manner and means of administering insolvent entities (as opposed to technological or organisational change). Legislative developments were absolutely crucial to the creation and destruction of jurisdictional vacancies for accountants and others. The key disturbance between accountants and lawyers in insolvency work emanated from the state in the form of the Bankruptcy Act, 1869. In Abbott's theory this represents an externally generated disturbance that created a vacant task area: bankruptcy trusteeships.

2.1. *Bankruptcy Act, 1869*

During the mid 19th century the law press reported concerns about invading accountants (Walker, 2004a). In the 1860s complaints centred on the usurpation of insolvency work conventionally performed by lawyers such as advising bankrupts and administering insolvent estates under trusts.

For much of the 19th century the English laws of bankruptcy (which related only to traders) and insolvency (which concerned non-traders) were separate. From 1861 these laws were merged and both traders and non-traders were subject to bankruptcy processes (Weiss, 1986:45; Markham Lester, 1995:61). Large partnerships and companies were, however, excluded from the provisions of bankruptcy legislation. The liquidation of joint stock companies was regulated by the Companies Act, 1862 (Markham Lester, 1995:222–228; Stacey, 1954:36–38).² Given the comparatively small number of limited liability companies in mid Victorian England most insolvent businesses were dealt with under the law of bankruptcy.³

The Bankruptcy Act, 1869 represented the latest in a succession of changes to the troubled law of bankruptcy. Under the Bankruptcy Act, 1831 the administration of bankrupt estates was founded on state control, or 'officialism' (Markham Lester, 1995:40–59).⁴ Under this system the Lord Chancellor appointed a number of 'official assignees' who performed the detailed management and distribution of bankrupt estates (Markham Lester, 1995:81–86; Weiss, 1986:42–43; Walker, 2004a). From the late 1850s 'officialism' was criticised as expensive and at variance with the notion

² The statute provided for three forms of winding-up. The court could appoint an official liquidator following the petition of a creditor; companies could be voluntarily liquidated by the members without court involvement; or, voluntarily liquidated under court supervision.

³ The average number of bankruptcies, assignments and compositions under the Bankruptcy Act, 1861 was 13,552 per annum, 1862–1868. This compares with about 70 liquidations per annum under the Companies Act, 1862 over the same period (Markham Lester, 1995:164–166, 228).

⁴ For the development of English bankruptcy law before 1831 see Hoppit (1987:29–41) and Markham Lester (1995:12–169).

that the management of the bankrupt's estate should be the responsibility of the creditors themselves (Markham Lester, 1995: 123–133). The Bankruptcy Act, 1861 introduced a degree of creditor control. The 1861 Act did not, however, quell criticism of the system of bankruptcy administration in England and Wales. During the 1860s the commercial and trading communities demanded a greater degree of creditor control and complained that the cost of administration by state officials was excessive. It was argued that the Scottish law of bankruptcy, which provided for management of bankrupt estates by creditor-elected trustees, was cheaper and should be emulated (Steel, 1881:21).

In March 1869, the Liberal government introduced a Bankruptcy Bill containing provisions variously described by contemporaries as sweeping and revolutionary (Routh, 1870:16; Treherne, 1870:iii–iv; *Hansard*, 5.3.1869:775). The resultant statute provided for the abolition of official assignees and their replacement by creditor-elected trustees. The trustee would manage and distribute the property of the debtor. The Bankruptcy Act, 1869 provided that the debtor's affairs could be dealt with as a bankruptcy or wound-up under liquidation by composition or arrangement with the creditors. The latter processes involved less publicity than formal bankruptcy and became very popular (Douglas, 1870). The trustee's administration and his accounts would be scrutinised by a committee of inspection (comprising creditors or their nominees) and transmitted annually to the chief official in London, the Comptroller in Bankruptcy (Bedford, 1869:1; Kemp, 1870:11; Smith, 1870:xvi–xviii).

Section 14 sub section 1 of the Bankruptcy Act did not specify the occupation of the trustee, merely stating that he be a fit person and remunerated as the committee of inspection saw fit (Smith, 1870:38, 85). Although the Attorney-General said during the progress of the Bankruptcy Bill through the House of Commons that he envisioned the creation of a class of professional trustees, the choice of the creditors in selecting trustees was to be 'absolutely unfettered' under the statute (*Hansard*, 5.3.1869:781). Despite their eligibility for election as trustees many solicitors considered that the Bankruptcy Act, 1869 represented an attempt by the business classes to secure their removal from this branch of practice (Walker, 2004a).

Abbott suggests that inter-professional boundary disputes are more likely to be resolved in situations where close social networks exist among professionals in local contexts. In large cities conflict may be more intense and resolution more difficult to achieve (1988:64–65). This was partly the case in relation to the responses of accountants and lawyers to the Bankruptcy Act, 1869. As the statute came into force, organisations representing

lawyers discussed whether or not to compete with accountants for trusteeships. In Liverpool a formal division of labour was established between local solicitors and professional accountants. Elsewhere the field was left open (Walker, 2004a). The scene was set for the next chronological stage posited by Abbott, competition between the two professions for the vacant jurisdiction of trustee. The next section analyses the extent to which inter-professional conflict actually ensued between accountants and lawyers.

3. Jurisdictional contest

3.1. Jurisdictional conflict

Evidence of apparent jurisdictional conflict between accountants and lawyers over insolvency work during the 19th century is not hard to find. In the pages of law journals, the accountant was usually portrayed as an 'ill-educated, rapacious and unscrupulous' usurper (*Law Times*, 27.3.1875:382; Sugarman, 1995:229–230). *The Accountant* considered that antagonism between the two professions was always 'latent' and was periodically inflamed by territorial disputes (22.7.1876:4). The Bankruptcy Act, 1869 created many sources of ignition over the distribution of work. The statute provided for example, that the trustee could receive proofs of debt and administer oaths. These responsibilities traditionally fell within the lawyers' domain. There were three main sources of lawyers' discontent: the dominance of trusteeships by accountants, the propensity of accountant-trustees to prepare legal documents and appear before the courts, and the level of accountants' remuneration.

Although accountants were to capture the majority of insolvency trusteeships (Walker, 2004b), an application of Abbott's analysis suggests that their jurisdiction was vulnerable during the 1870s (1988:44–49). There were a number of points of weakness. The effectiveness and expense of the accountants' solutions in bankruptcy administration were measured, published and adversely criticised by the Comptroller in Bankruptcy. Inter-professional boundaries were not clearly defined (56). Trusteeships could also involve long 'chains of inference' (50) – performance of the task involved relying on the participation of other professions such as lawyers and auctioneers. In small bankruptcies trusteeship involved routine processes (51). Accountants' claims to exclusive practice were not strongly legitimised by the development of formalised systems for the transmission of expert knowledge because these had not been matured by the disparate organisations representing professional accountants (52–56, 103–104; Walker, 2004b). For these reasons the appointment of accountants as trustees was contested. The result was an acrimonious discourse in the profes-

sional press.

As the Bankruptcy Act, 1869 came into effect in 1870 solicitors complained to the law journals that accountants were winning trusteeships and gaining a 'prominent position' in the bankruptcy court (*Law Times*, 26.11.1870:66; 5.11.1870:2). In consequence, 'in the large centres particularly, much jealousy regarding the encroachments of these gentlemen exists amongst the legal profession' (*Law Times*, 11.6.1870:101). In a leading article in November 1870 the *Law Times* conceded that under the new Act 'no system could possibly have been devised which so advantageously operated to their [the accountants'] interest' (12.11.1870:19; *Solicitors' Journal*, 24.5.1873:570). In 1873 a solicitor complained that in the London Bankruptcy Court 'the functions of both counsel and attorney were completely superseded by accountants, or persons calling themselves accountants' (*Solicitors' Journal*, 15.2.1873:312). By 1874 an influential correspondent conceded that accountants had monopolised bankruptcy and liquidation trusteeships under the 1869 Act (*Law Times*, 24.1.1874:224).

Anecdotes were supplied to the law journals on the unprofessional manner in which accountants competed for and won trusteeships (*Law Times*: 7.10.1871:401; 23.3.1872:396; *Solicitors' Journal*, 14.12.1872:121; 21.12.1872:140; 21.11.1874:51). Copies of circulars distributed by 'accountants' and 'bankruptcy practitioners' were submitted to illustrate how 'charlatan' accountants filched business from attorneys.⁵ The complaints of solicitors also focussed on the intrusion of accountants in areas clearly perceived as the lawyer's jurisdiction such as the preparation of legal instruments (*Law Times*, 17.9.1870:367). Correspondents objected that accountants as trustees and debt collectors were trespassing by drawing up wills, settling and passing accounts and offering advice on matters arising from the administration of bankruptcies (*Law Times*, 23.9.1871:375; *Solicitors' Journal*, 24.5.1873:570).

The 1869 Act had intended that trustees might appear before the court without a solicitor (*Law Times*, 6.3.1875:326). So far as lawyers were concerned the capacity of accountant-trustees to address the courts was a usurpation of the traditional function of both solicitors and barristers. One solicitor claimed, exaggeratedly, that 'in County Courts and other tribunals, the profession was robbed by accountants and agents of all kinds' (*Law Times*, 29.11.1873:80; 1.5.1875:14; *Solicitors' Journal*, 1.1.1870:177; 15.2.1873:312; 10.5.1873:543). It was the distaste of certain judges at the appearance of

accountants before the courts that resulted in outbursts of the kind notoriously uttered by Mr Justice Quain at the Bristol Assizes in August 1875 when he said that 'the affairs of bankrupts now got into the hands of accountants, debt collectors, and others ... That the whole affairs in bankruptcy should be taken out of the hands of solicitors-a respectable body, subject to the control of the court-and handed over to an ignorant set of men called accountants, was one of the grossest abuses, in his opinion, ever introduced into the law' (*Accountant*, 21.8.1875:11). In 1875 and subsequently, a number of county court judges also commented disparagingly on the appearance of accountants before the courts (*Law Times*, 10.7.1875:190).

There were two other sources of complaint by lawyers. First, the intrusion of accountants was particularly galling because solicitors incurred heavy expenses to train for and enter their profession and assumed an entitlement to reap concomitant rewards. However, their supposed advantage was negated by the incursion of uninstructed accountants who simply put up a brass plate and offered services to the public (*Law Times*, 9.5.1874:32; 25.7.1874:236; 1.5.1875:14). Second, solicitors objected to the limited restrictions on the (high) remuneration of accountants (*Law Times*, 6.1.1877:174). In bankruptcy cases trustees' commission was determined by the creditors, from whom the accountant-trustee himself might hold proxies (5.11.1870:2). By contrast, solicitors' charges were regulated by statutory scales of fees (23.4.1870:488; 16.7.1870:216).

The Accountant complained bitterly at the abusive rhetoric against accountants printed in the law journals and explained this as a jealous response to the loss by solicitors of insolvency business and their frustrated attempts to retain monopolies (24.4.1875:3-4; 8.5.1875:5; 15.5.1875:5-6; 5.6.1875:5; 21.8.1875:2-4; 22.7.1876:4-5; 30.9.1976:3; 2.6.1877:2; 18.5.1878:4). The journal also identified instances where solicitors were engaged in objectionable practices such as touting and charging excessive costs. It objected to the hypocrisy of lambasting 'bankruptcy accountants' when the unscrupulous 'bankruptcy solicitor' was at the root of dubious activities in insolvency administration (31.7.1875:14; 25.1.1876:10; 3.6.1876:3-4; 17.8.1878:5; 31.8.1878:5-6; 12.10.1878:7-8; 16.11.1878:4; 18.1.1879:3; 14.6.1879:3).

3.2. Mutual dependency

As the foregoing illustrates, it is possible to find evidence of a virulent jurisdictional contest between accountants and lawyers of a kind envisaged by Abbott. However, this portrayal of conflict emanates substantially from the professional journals. A more complex set of inter-professional relation-

⁵ The difference between an 'attorney' and a 'solicitor' related to the practise of the former in courts of common law and the latter in chancery. Under the Supreme Court of Judicature Act, 1873, which came into force in 1874, attorneys assumed the title of solicitor (Reader, 1966: 25).

ships appears to have characterised everyday practice. In part this reflected the importance of the law to the everyday practice of both accountants and solicitors.

Abbott recognises that '[S]ometimes members of different professions serving common clients generate bonds through their clients' (1988:124). The relationship between accountants and solicitors in Victorian Britain was often one of mutual dependency (Sugarman, 1993; Walker, 1993). In 1885 F.W. Pixley wrote that 'as a rule, by far the greater number of the matters transacted in a CA's chambers are introduced by Solicitors. It is, therefore, evident that success depends upon obtaining the confidence and support of members of this profession' (quoted in Walker, 1988:194). Mutual dependency tempered by respect for professional boundaries was advised in one contemporary text on bankruptcy: 'Business is always best done where each man confines himself to his particular province. No accountant should therefore, presume to give legal advice nor to act without it' (Bergtheil, 1879:13).

Accountants' forays into lawyers' territory were also checked by fears of antagonising so powerful a profession (Caldecott, 1875:41). In his Inaugural Address as President of the Manchester Institute of Accountants on 3 April 1871, David Chadwick referred to the desirability of 'the most perfect confidence' between accountants and lawyers (1871:5). In proceedings such as corporate liquidations he alluded to the benefits of the 'united action, and earnest co-operation of a sound Lawyer, and a good Accountant' (7).

The practical operation of bankruptcy proceedings also tended to encourage a co-operative relationship between accountants and solicitors. Insolvent traders traditionally sought a solicitor when financial disaster first struck. The solicitor might then engage an accountant to draw up the accounts of the bankrupt (Report from the Select Committee, Minutes of Evidence, 1864:60–61, 308). Legal questions inevitably arose in complex bankruptcies and contemporaries argued that for their own protection, trustees (accountants and others) should 'obtain legal advice' (Routh, 1870:23). In these ways some recognised that the Bankruptcy Act, 1869 offered opportunities for both accountants and solicitors to prosper (*Law Times*, 12.11.1870:19; 24.1.1874:224; *Solicitors' Journal*, 3.11.1869:10).

Anecdotal evidence also confirms inter-professional co-operation. It was reported that accountants and solicitors collaborated at creditors meetings (*Law Times*, 7.10.1871:402). References were made to 'the connections and alliances between certain bankruptcy accountants and certain solicitors, who as a rule always act with each other when they can' (*Law Times*, 24.1.1874:224).

Although a source of complaint in the legal press, instances of accountants employing attorney's clerks showed how the occupations combined to take mutual advantage of the opportunities presented by the Bankruptcy Act, 1869 (*Law Times*, 14.10.1871:414, 429). Instances were reported where a 'jackal' accountant combined with a lower class of attorney to establish a liquidation or bankruptcy 'manufactory' (*Solicitors' Journal*, 2.9.1871:804–805). During the late 1870s cases were reported of solicitors paying accountants fees for the introduction of clients and divisions of remuneration between the two sets of professionals (*Solicitors' Journal*, 11.5.1878:545; *Law Times*, 25.5.1878:73).

The manner in which the Bankruptcy Act, 1869 represented a bonanza for *both* accountants and lawyers was a constant theme in the annual reports on the working of the statute by the Comptroller in Bankruptcy, Mansfield Parkyns. In seeking explanations for the continuing high cost of bankruptcy administration, Parkyns considered that solicitors and accounting firms co-operated in the acquisition and servicing of insolvency clientele. The Comptroller noted that in 1871 16% of the assets of bankrupt estates were being consumed by legal costs. In 1872 the figure was 18.5%. Trustees' remuneration represented 6.5% and 6.75% in these years respectively (General Report, 1873:2). In 554 insolvent estates closed in 1876 law costs amounted to 14.2% of estate assets and trustees' remuneration comprised 8.8% (General Report, 1877:12). In 1883 the figures were 18.6% and 14.0% respectively (General Report, 1884:10–11). In small insolvencies under the 1869 Act, which comprised the majority of cases, law costs were 37% of assets in bankruptcies and liquidations while trustees' remuneration amounted to 15% (Report by the Board of Trade, 1884:12). Far from being a measure detrimental to solicitors, the 1869 Act had proved a boon (*Hansard*, 11.3.1878:1130; 16.7.1879:564, 571, 588–589).

Solicitors and accountants both benefited from the Bankruptcy Act, 1869 (in the absence of a formal division of labour) in two other ways. First, although accountants occupied trusteeships, solicitors were appointed to that office in most other cases. Second, the statute had effectively and almost unwittingly created a new appointment, 'Solicitor to the Trustee'. It had been envisaged when the 1869 Act was passed that the appointment of competent, well-remunerated trustees would obviate the need for a lawyer (General Report, 1873:2). Practice had proved otherwise. Trustees were dependent on solicitors, regularly employed them with the concurrence of the committee of inspection, and paid their fees out of the debtor's estate (Salaman, 1871:170–174). In his report for

1875 the Comptroller commented: 'as a rule...neither the experience of the professional trustees nor the large sum paid them for realising the estate, has prevented their incurring at least as heavy solicitor's charges as when the solicitor's bill included nearly the whole charges of realisation' (General Report, 1876:2).

The following year the Comptroller reiterated that in the great majority of insolvencies the trustee employed a solicitor. Further, 'Under the Act of 1861 solicitors could manage very well in the great majority of cases without the aid of paid managers; it is evident that accountants are not as independent of solicitors' (General Report, 1877:13; 1878-9:6; Supplemental Report, 1877:10). In his report for 1878 Parkyns stated 'many trustees are obliged to share their remuneration with the solicitors who bring them business' (General Report, 1878-9:7). The Comptroller went so far as to suspect collusive behaviour by the two professions because with the exception of large, complicated insolvencies 'the employment of a solicitor by an experienced trustee is unnecessary ... the now almost invariable *appointment* of a 'solicitor to the trustee,' whether he is wanted or no, is in the majority of cases absolutely useless, except for the purpose of making costs' (Supplemental Report, 1877:18; General Report, 1877:11; General Report, 1880:5).⁶

Suspicions of an inter-professional plot were alluded to by others seeking bankruptcy reform. In March 1876 the Secretary of the Mercantile Law Amendment Society wrote to the Lord Chancellor citing 12 cases of bankruptcy where 26% of the assets was consumed by trustees' remuneration, 24% in charges of the trustee's solicitors, and only 20% was paid to the creditors. The correspondent noted: 'No doubt in many cases unnecessary legal charges are incurred, because the Trustee may have been indebted to the influence of the Solicitor for his appointment, and in return for such obligation, he puts as much business in his way as possible' (LCO1/16).

Attempts to maintain a co-operative relationship

⁶ Fee sharing was also alluded to before the Select Committee on the Companies Acts in 1877 in relation to corporate liquidations where an accountant-liquidator and solicitor worked in tandem. A senior accountant conceded that while the 'dishonourable practice of a division of profits by the liquidator with the solicitor' (Report from the Select Committee, 1877: 87) was not common, it did occur. In 1887 it was stated in *Truth* that 'The winding-up of companies affords grand opportunities of a mutual profit, for an official liquidator has to be appointed, and he is the nominee of the solicitor, who, as a return compliment, is entrusted with the legal representation of that important personage' quoted in *Accountant*, 19.2.1887: 99; see also 1.2.1890: 55; 15.2.1890: 73-74).

⁷ From 1880 the ICAEW also distributed official lists of members to most solicitors in the UK (*Accountant*, 17.6.1882: 4).

with lawyers was also evident in the activities and pronouncements of the organisations of accountants formed in England during the 1870s. A representative of the local legal profession was often invited to annual dinners and his vocation the subject of a toast (*Accountant*, 13.5.1876:7; 11.5.1878:7-8; 10.5.1879:7; MS28408/2:39; MIA Minute Book:97-98, 131, 138, 172, 180). The accountancy bodies distributed lists of their members and copies of rules to local solicitors (MS28408/2:108; MIA Minute Book:14). The Manchester Institute of Accountants prepared 'A printed list of the Fellows of the Institute as proposed to be framed and glazed and issued to Solicitors and Public Companies for hanging on the walls of the various offices' (Minute Book:28, 39, 68-69, 75, 108, 109, 141).⁷ Even though Mr Justice Quain's outburst indicated tension between accountants and the judiciary, this should not necessarily be taken as illustrative of wider inter-professional conflict. At the half yearly general meeting of the Institute of Accountants in October 1875 it was decided not to pursue Justice Quain's comments as 'members of the profession constantly meet with most courteous treatment at the hands of Her Majesty's Judges' (MS28404:60).

3.3. Identifying combatant professions

One of the problems in tracking inter-professional conflict of the kind posited by Abbott, and a likely explanation for the apparently contradictory discourses of mutuality and hostility, is the fact that it is extremely problematic to pose jurisdictional disputes as involving two monolithic groups of accountants and lawyers during the mid to late 19th century. Abbott does not assume that professions are homogenous, internally undifferentiated entities, but his systemic analysis often portrays them as such. He recognises that intraprofessional status differences exist and are significant for the maintenance of jurisdictional control (1988:118-120, 122-124, 128) but he suggests that internal 'status strains' are not apparent in discourses attending inter-professional conflicts. This is because organisational elites representing professions are 'relatively ignorant of the skeletons in other professions' closets. Consequently, pariah professionals disappear from formal inter-professional discourse altogether' (121). This appears too generalised in the case of lawyers and accountants. Certainly there were occasions where lawyers appeared unaware of a status hierarchy among accountants. Yet, internal differentiation and the activities of the 'so-called accountant' increasingly became central to the inter-professional discourse.

The solicitors' profession was not a homogenous entity wholly engaged in inter-professional conflict. Sugarman has illustrated that within the Law Society there were differences over whether certain

tasks should be competed for or not (1996: 98). It appears that most discontent over insolvency work was expressed by country and young solicitors whose attempts to establish practices were thwarted by accountants and other 'raiders' (*Law Times*, 3.6.1876:90; 16.12.1876: 123; 10.9.1881:329; 15.10.1881:397). Newly qualified solicitors particularly objected to the competition they faced from accountants who had not attempted to build careers on the basis of substantial outlays on vocational preparation (*Solicitors' Journal*, 3.6.1876:611). Older, established solicitors in large London firms were less inclined to engage in conflict.

The notion of a unitary accountancy profession is even more problematic. The nomenclature 'accountant' during the 1870s described a hierarchy of statuses from the public practitioner who was a member of a professional organisation, to the uninstructed individual who assumed the title 'accountant' overnight and offered a range of services from trusteeship, rent collection to drawing up wills. As *The Accountant* stated in response to abusive rhetoric from lawyers, the accountancy profession 'contains men whose names are as well known and whose capabilities are as high as those of any of the great London solicitors' (6.3.1875:2). However, the profession was tainted by the appearance and high profile of the unscrupulous accountant-trustee (*Hansard*, 17.2.1879). In June 1883 the President of the Board of Trade, Joseph Chamberlain stated in the House of Commons 'that many of the persons who accept the office of trustees in Bankruptcy have been little better than swindlers' (*Hansard*, 21.6.1883; 19.3.1883).

The accountant-target for antagonistic lawyers was moveable and ill-defined. Sometimes objections were made against the whole 'class' of accountants. At other times the diatribe was levelled against the unqualified practitioner who couldn't distinguish a debit from a credit; those who paraded themselves as 'half lawyers' or 'legal accountants' who terrorised debtors with court proceedings they were incompetent to pursue; or ex-attorney's clerks who had traitorously become accountants or joined an accounting firm. Some 'accountants' were perceived as respecting the territory of solicitors, others as having no inhibitions about trenching all over it (*Law Times*, 24.1.1874:224; *Solicitors' Journal*, 21.12.1872:140; 4.1.1873:187; 1.11.1873:9; 4.1.1879:173; 24.4.1880:493).

While scorn was periodically poured in the law journals on public accountants (*Law Times*, 28.8.1875:309) it was increasingly conceded that a number of 'genuine' respectable accountants did recognise the distinctive sphere of the legal profession (*Law Times*, 8.1.1876:186; *Solicitors' Journal*, 21.11.1874:51; 19.12.1874:126). It was primarily the activities of so-called accountants in

insolvency administration which gave solicitors cause to rail against the behaviour of all who assumed the title 'accountant' or combined it with 'debt collector', estate agent' etc. As will be illustrated later, lawyers increasingly argued that one solution to the problem of the intruding accountant was for the accounting profession to pen the black sheep in its midst.

4. Transformation leading to balance

The third chronological stage in Abbott's thesis concerns the restoration of balance in inter-professional relations. This section explores whether a settlement was reached between accountants and lawyers over bankruptcy work during the late 19th century.

Abbott contends that jurisdictional conflicts between professions may be settled (temporarily stabilised) in a number of ways. At one extreme settlement takes the form of a single victor gaining full jurisdictional control. More limited settlements include the determination of a dominant and a subordinate profession (as in medicine and nursing); drawn contests with a clear division of a jurisdiction between combatants; 'intellectual jurisdiction' where one profession has control of knowledge but practice is open to others; conferment on one profession of advisory control of aspects of work; and division of jurisdiction by nature of client (1988:69). The following illustrates that the resolution of conflicts between accountants and lawyers in Victorian England are not easily accommodated within this schema.

Both accounting and legal journals argued that a remedy to the problem of boundary definition between the accountants and lawyers should be found (*Solicitors' Journal*, 7.11.1874:10). It was also recognised that such an outcome would be difficult to achieve (*Law Times*, 11.6.1870:101, 26.11.1870:66). Solicitors suggested various ways of settling disputes with accountants. These included pursuing offending accountants through the courts; seeking statutory intervention to define territory, and protective action by professional organisations. One solicitor suggested a more formalised division of labour through the stipulation of accountants as insolvency trustees and solicitors as responsible for taking oaths and filing bankruptcy petitions (*Law Times*, 6.3.1875:326).

Some argued that individual solicitors should compete more forcibly with accountants in the market for insolvency services by canvassing for appointments, challenging accountants for trusteeships, refraining from referring work to the rival occupation and even appropriating the accountants' knowledge base by becoming expert in bookkeeping (*Law Times*, 17.1.1874:206; 2.5.1874:14–15). Other solicitors suggested passivity, were fatalistic or argued that lawyers retreat from the field. One

correspondent argued that the public would become wise to the misdemeanours of charlatan accountants and revert to qualified solicitors. The correspondent also noted that quacks usually became the subject of litigation and that meant work for solicitors. Further, it might enhance the status of solicitors if they ditched work associated with insolvency and concentrated on the core work of the profession (*Law Times*, 7.10.1871:401; *Solicitors' Journal*, 19.12.1874:126).⁸

4.1. Intellectual jurisdiction

Given that trusteeships under the Bankruptcy Act, 1869 were dominated by accountants, and solicitors to the trustee conducted most of the legal work relating to the administration of the insolvent estate, one could argue that an Abbott-like informal division of labour between the two professions over task was worked out. This was based on the assumption that accountants, as men associated with business and the preparation of accounts, had an intellectual claim to perform the functions of trustee, while the solicitor was reposed of appropriate knowledge in related legal matters. In May 1880, for example, *The Accountant* asserted that:

‘It has, within the last few years, become a well accepted fact that there is a broad and clear line of demarcation between legal work and that of administering in the winding-up of insolvents’ estates, and that skilled accountants are, as a rule, the best persons to perform the duties indicated in the latter division. It is, moreover...equally true that lawyers, as a body, have not the training and the knowledge of accounts necessary to perform such work efficiently’ (29.5.1880:3).

Similarly, the Secretary of the Institute of Accountants stated in 1875: ‘Of course, there are matters which ought at once to be handed over to the solicitor, as to which the safest rule is perhaps this that an accountant ought to do for himself those things which any clever business man would and could do – and to hand over to the solicitor all that such a man would consider beyond his province’ (MS28408/2:81–82). However, with the possible exception of solicitors and accountants in Liverpool, there was no formal inter-professional allocation of work, particularly in relation to trusteeships. Lawyers competed for trusteeships with accountants.

4.2. Settlement and the ‘legal system’

For Abbott the ‘legal system’ (comprising the legislature, the courts and administrative machinery) represent arenas for the advance by profes-

sions of jurisdictional claims (1988: 62–63). When claims made before these institutions are secured, they tend to offer enduring protection and codify clear professional boundaries. For Abbott ‘the legally established world of jurisdiction is a fixed, static world’ (64). This was not so in relation to accountants, lawyers and insolvency work.

4.2.1. The legislature

Abbott recognises the importance of the state in his system of professions. It is a client, the medium for regulatory change and a competitor for professional services (1988:141). In France the state has played a central role in shaping professions and determining their jurisdictions. In the US, by contrast, the state has encouraged the market determination of professional jurisdictions. In Britain the state stands between these two poles. While state intervention is evident in cases of registration, jurisdictions have tended to be determined by the outcome of inter-professional competition between private associations (1988:161–166). This potentially complicates and prolongs the determination of settlements over the allocation of work.

4.2.1.1. Lawyers’ attempts at statutory settlement

The state is also the focus for the promotion of demands by professions for statutory protection. Indeed, some lawyers called for legislation to prevent accountants from acting in the county and bankruptcy courts (*Law Times*, 1.5.1875:14). However, the capacity of lawyers to achieve a statutory-based settlement of their dispute with accountants was limited. Although it could boast disproportionate influence in Parliament, the solicitors’ profession was impeded by weak organisation during the 1870s. In 1876 it was reported that the profession was represented by no fewer than 39 national and provincial organisations. Of the 11,000 enrolled solicitors, 4,000 belonged to no law society (*Law Times*, 2.9.1876:308). This diffuse organisation was rationalised to some extent in 1873 when the main national bodies, the Metropolitan and Provincial Law Association and the Incorporated Law Society merged. Yet, by 1880 no more than a quarter of solicitors were members of the unified Law Society and the local law organisations retained much of their autonomy (Sugarman, 1996:102–107).

In this context some solicitors expressed anxiety about the capacity of their professional organisations to counter the threat of interloping accountants (*Solicitors' Journal*, 2.9.1871:804–805; *Law Times*, 23.9.1871:375; 7.10.1871:401; 14.9.1878:341; 29.3.1879:399). Demands were made for solicitors and their organisations to rouse themselves from apathy, display unity and exploit their influence with the legislature to secure the statutory protection of lawyers’ territory (*Law*

⁸ This argument resonates with Abbott’s concept of professional regression (1988: 119).

Times, 7.1.1871:185; 12.11.1870:19; 1.11.1873:8; 14.12.1878:122).

One organisational response to these demands was the Legal Practitioners Society. This was founded on 20 November 1873 and existed until January 1880. Among the Society's objectives was the protection of the solicitor profession 'against the depredations of unqualified men' (*Law Times*, 15.11.1873:43; 22.11.1873:62). In early 1874 the Society was perceived as an organisation to protect solicitors 'from the intrusion of accountants and others' (*Law Times*, 17.1.1874:199; 21.4.1874:223). One member argued that the Society 'should certainly endeavour to suppress a certain class of accountants, as they were a perfect nuisance to the profession' (*Law Times*, 28.11.1874:69).

During the mid 1870s the Legal Practitioners Society focussed on 'inter-professional questions', and pursued statutory measures to eliminate the nuisance of 'unqualified and unauthorised practitioners' (*Law Times*, 5.2.1876:251). In 1876 the Society received many letters from solicitors in the provinces complaining about the behaviour of accountants, debt collectors and mercantile agencies (*Law Times*, 16.12.1876:123). These were referred to as 'social pests' at the annual meeting of the Society in 1879 (3.5.1879). The Secretary of the Society conceded that 'There can be no doubt that much of the Professional work not protected by statute, which was formerly undertaken exclusively by solicitors, is now transacted in London by accountants and law stationers, and in the country by accountants and so-called law agents' (16.12.1876:123).

The problem of accountants was recognised as a matter 'which required settling' (5.2.1876:258–259) and soon after its formation the Legal Practitioners Society attempted to secure statutory protection. In March 1874 a Legal Practitioners Bill sought action 'against unskilled and unqualified persons assuming to act as legal practitioners' (Legal Practitioners Bill, 1874:1). It provided that if an unqualified person prepared a legal instrument for a fee he could be fined £10 in the county court. During the Second Reading of the Bill in the House of Commons illustrations were given of the impositions of accountants on solicitors and the public (*Hansard*, 8.7.1874:1271–1275).⁹

Much to the dismay of the Legal Practitioners Society (*Law Times*, 21.11.1874:52), this attempt at statutory settlement was thwarted by the Solicitor-General. Sir John Holker contended that the provisions of the Legal Practitioners Bill con-

tradicted free trade – the right of anyone to employ unqualified persons if they chose to do so within the law. Further, there were occasions, such as in bankruptcy cases, where an accountant was the more appropriate party to draw up instruments than a solicitor (*Hansard*, 8.7.1874:1279–1281; *Law Times* 14.3.1874:352–353; 4.7.1874:178; 27.6.1874:165; 21.11.1874:52; 25.12.1875:150).

Legal Practitioner Acts were passed in 1875, 1876 and 1877. Each of these represented a substantially diluted version of an original bill and failed to formally settle jurisdictional conflict between accountants and lawyers (Legal Practitioners Bills, 1875, 1876, 1877). While the 1877 statute prevented unqualified practitioners from drawing up papers for probate and letters of administration, none of the Legal Practitioner Acts contained clauses that defined the territories of lawyers and accountants in relation to the preparation of legal instruments. Other legislation, such as the Attorneys and Solicitors Act, 1874, which rendered it a criminal offence for a person to practice under a name which implied that he was a qualified attorney or solicitor, was also of marginal relevance to the settlement of jurisdictional boundaries.

Although the Legal Practitioners Society was unsuccessful in securing statutory jurisdictional settlements, its activities in and out of Parliament were, however, credited with discouraging accountants from trespassing on the terrain of solicitors (*Law Times*, 23.12.1876:132; 20.5.1876:47; 25.11.1876:59).

4.2.1.2. *The Bankruptcy Act, 1883*

Another feature of boundary settlement between accountants and lawyers through the 'legal system' was the Bankruptcy Act, 1883. In his case study of lawyers and their competitors Abbott suggests that this statute represents an invasion on the terrain of solicitors 'not by other professionals, but by Her Majesty's Government', an instance of the state behaving as a professional competitor (1988:270, 277). While the Bankruptcy Act, 1869 had privatised bankruptcy administration under trusteeships the 1883 statute re-imposed state control. Bankrupt estates would be managed by officials of the Board of Trade. For Abbott, the reappearance of 'officialism' represented a co-equal jurisdictional settlement between the state and solicitors through a division of labour in the supply of legal services with the state assuming responsibility for most bankruptcy work (1988:271). A deeper investigation of the genesis of the Bankruptcy Act, 1883 reveals that Abbott's conclusions are oversimplified. The following discussion indicates that the Liberal government responsible for the 1883 Act did not intend a co-equal division of labour between the state and solicitors. The legal inter-professional 'settlement' effected by the statute was multifaceted

⁹ The Council of the Institute of Accountants (in London) were alerted to the provisions of the Bill which 'appear to affect injuriously the interests of accountants by subjecting them to penalties in the County Court and taking away their right in certain cases to recover any remuneration for their work' (MS28408/2: 23–26).

and obscure.

The politics of bankruptcy reform suggests that resolving inter-professional discord was far from the minds of the architects of the Bankruptcy Act, 1883. Concepts of creditor control, officialism, decentralisation, the appropriate treatment of bankrupts, maintaining the public interest and remedying the defects of extant legislation dominated the debate. According to Markham Lester (1995:184–193, 207–214) the provisions of the Act reflected acceptance that the government should assume a supervisory role in bankruptcy administration, a decline in the power of the business lobby, increasing government intervention and the influence of the President of the Board of Trade, Joseph Chamberlain, and his officials.

The Bankruptcy Act, 1883 provided for the supervision of bankruptcy by the Board of Trade. The Board would appoint official receivers to administer debtors' property until a trustee was elected by the creditors. Despite demands that eligibility for trusteeships be confined to chartered accountants (*Accountant*, 8.4.1882:4), the statute continued the practice of open competition and the election of a 'fit person' as trustee by the creditors (Bankruptcy Act, 1883, s.21). The President of the Board of Trade determined not to create a monopoly of trusteeships. In his view the organised accountancy profession was not sufficiently mature for its members to be granted control over these appointments (*Accountant*, 5.5.1883:10).

In cases where the bankrupt's assets were less than £300 the official receiver would act as trustee (Markham Lester, 1995:194–199). From 1883 to 1913 over 80% of cases were of this type and the vast majority of bankrupt estates were administered by official receivers. As far as creditor-elected trustees were concerned: 'While official receivers administered five to six times as many cases as non-official trustees, non-official trustees were in charge of cases approximately three times the value in gross receipts...the official machinery was not needed for the larger cases where creditors often chose an eminent accountant to serve as special manager and provided a first-rate solicitor to assist him' (Markham Lester, 1995:292).

The President of the Board of Trade envisaged little change of official personnel as a result of the Bankruptcy Act, 1883, nor the creation of a rival profession of state bureaucrats. In 1875 the Comptroller in Bankruptcy had suggested that most of the work under a government controlled system of insolvency administration could be performed by junior clerks as opposed to professional men (Supplemental Report, 1877:19–20). In answer to a parliamentary question the President estimated an additional 30–40 clerks would be needed for the purposes of the new bankruptcy regime and that official receivers would be

appointed for over sixty county court districts. This compared to a similar number of registrars under the Bankruptcy Act, 1869 (*Hansard*, 12.3.1883:197; 19.3.1883:821). When the Act of 1883 came into force the existing staffs of the office of the Comptroller in Bankruptcy and the London Bankruptcy Court were simply transferred to the Board of Trade (General Report, 1884:2; Bankruptcy Act, 1883, s.153).

Conformity with Abbott's analysis would indicate that accountants should have been favoured by the Bankruptcy Act, 1883. Abbott's sequencing of inter-professional conflict is quite specific: '[U]jurisdictional invasion generally begins in the workplace, then moves to the public mind, and then into the law' (1988:139). Abbott considers the loss of bankruptcy work by lawyers to accountants during the 19th century as compliant with this schema (140). We might reasonably expect then, that as accountants had come to dominate insolvency trusteeships during the 1870s, the 1883 statute would represent the culmination of a victory for accountants by codifying their jurisdiction under statute. In fact, this was not to be. Accountants and commentators alike observed that the profession was badly treated in 1883 (*Accountant*, 24.11.1883:18). At the annual meeting of the ICAEW in May 1884 members expressed their dismay at the apparent hostility of the President of the Board of Trade to the profession. The vice-president of the Institute reported that if it were not for three deputations to Joseph Chamberlain and discussions with officials the winding-up of bankrupts' estates would have been 'taken away from accountants'. He added that on reading an early draft of the measure accountants 'found ourselves swept out of bankruptcy altogether'. Despite the concessions subsequently achieved another member stated that he 'could not see one gleam of sunshine for their profession' in the Bankruptcy Act, 1883 (*Accountant*, 10.5.1884:9–16; *Law Times*, 28.6.1884:169; Stacey, 1954:25, 56).

When the Bankruptcy Act was passed attention turned to the professions from which official receivers would be selected. The matter was left open in the statute. Some argued that all official receivers should be chartered accountants (*Accountant*, 15.9.1883:6). While *The Accountant* hoped that the best men should be selected irrespective of occupation: 'As a rule, accountants may be considered best qualified for the post, and solicitors the least qualified' (26.5.1883:3–4; 10.11.1883:13). For legislators the main issue was not the profession from which official receivers were drawn but the scope for the Board of Trade to exercise political patronage (*Hansard*, 19.3.1883:839–840, 875, 891, 894–897, 903–904; 14.8.1883:522–526; 20.8.1883:1324–1325, 1329;

Markham Lester, 1995:204). The announcement of each appointee was scrutinised for evidence of political preference. When a chemist and a draper were appointed as official receivers, their credentials as active Liberals was noted (*Accountant*, 15.12.1883:6; 16.2.1884:15). The depth of concern about politicisation ensured that the special committee appointed to select the first official receivers was ordered to submit a report on its deliberations. The special committee subsequently reported its receipt of 1,900 formal applications for official receiverships. The decision making does not suggest that the state had determined an inter-professional settlement over the award of these appointments. On drawing up short lists:

'...the Committee limited themselves to no class. The list included solicitors, accountants, bank managers, land agents, high bailiffs, and non-professional gentlemen – the Committee, while preferring solicitors and accountants as, presumably, from their professional training, possessing many of the qualifications necessary, being also well disposed to accept other candidates, who appeared to be qualified by their general intelligence and business experience, as not unlikely to bring fresh and vigorous minds to the performance of their duties' (Report to the President of the Board of Trade, 1884:1).

The special committee recommended the appointment of 37 official receivers for 65 county court districts. Twenty-five of the appointees were solicitors, four were chartered accountants. Others included town clerks, a bank manager, a clerk to a poor law union and a surveyor of taxes. The discussion of the report of the special committee in Parliament focussed on the large number of Liberals among the appointees and there was much cynicism about the committee's declaration that the political allegiances of candidates was irrelevant (*Accountant*, 16.2.1884:15). When a complete list of official receivers was announced in January 1884 it revealed the following: solicitors 38, chartered accountants 10, other occupations 12, occupation not stated 9 (*Accountant*, 21.1.1884:14–15). The Chief Official Receiver, Robert P. Harding, was a chartered accountant. The Inspector-General, John Smith, had been successively an Edinburgh chartered accountant and a banker (Stewart, 1977:153–154).

No clear inter-professional settlement therefore emerged from the Bankruptcy Act, 1883. The government left the professions to compete for occupancy of official receiverships and trusteeships as opposed to filling them with state bureaucrats. The appointments under the statute represented 'no addition to the permanent Civil Service Establishment'. By 1885 the Bankruptcy Department of the Board of Trade comprised a sig-

nificant complement of 97 persons, with the exception of the aforementioned, most officials were clerical functionaries (Markham Lester, 1995:288; Second Report, 1884–85:6–8).

In fact, in its deliberate attempt to facilitate competition for trusteeships and official receiverships, it could be argued that the 1883 Act was no settlement of the conflict between accountants and lawyers at all. The senior bankruptcy officials under the 1883 Act and a number of district receivers were accountants; solicitors dominated official receiverships but in large bankruptcy cases where a trustee was elected, accountants gained most appointments and were assisted by solicitors. The Board of Trade seemed content with the participation of both professions. In 1885 the Board asserted that 'it is desirable not to discourage the employment of solicitors and accountants when their employment is really necessary or useful to the estate' (Second Report, 1884–85:5). A reading of the Act and annual reports on its working also reveal the continued participation of other occupational groups such as auctioneers and brokers in insolvency work. It is therefore difficult to agree with Abbott's conclusion that the Bankruptcy Act, 1883 was an incursion by government into the professional field resulting in a co-equal division of labour between lawyers and the state.

This absence of a clear jurisdictional settlement between accountants and lawyers in insolvency work continued through the 1880s. In 1888 *The Accountant* still referred to the 'legitimately disputed border-land between the two professions' in bankruptcy. In 1888 the ICAEW complained to the President of the Board of Trade that solicitors were preparing debtor's statements of affairs and sought the confining of this function to professional accountants (5.5.1888:282; Howitt, 1966:33). When it was rumoured that the board had issued instructions that only accountants should be employed to assist debtors prepare financial statements, the Law Society argued that solicitors had sufficient knowledge of accounting to perform this function in most cases (*Accountant*, 10.11.1888:728). Not surprisingly, accountants claimed that this task fell within their domain on the basis of superior knowledge (*Accountant*, 15.12.1888:811). The occupational demarcation of preparing debtors' accounts resurfaced during the early 1890s (*Accountant*, 22.2.1890:91, 22.3.1890:141, 15.4.1893:342–343) and continued into the twentieth century. In evidence given to the Mackenzie Committee in 1908 on the working of the Bankruptcy Act, a chartered accountant continued to object that some debtors' solicitors were preparing the statement of affairs and reiterated that this should be the exclusive province of professional accountants (Report of the Committee, 1908, Minutes of Evidence: 1–2, 4–5, 8).

4.2.2. The courts

Another component of the 'legal system' through which inter-professional disputes may be settled is the judiciary itself. During 1876 solicitors complained that accountants offering to prepare bills of sale represented an invasion of their territory (*Law Times*, 29.4.1876:474; 17.6.1876:128). Jurisdictional dispute over the preparation of such legal instruments was partly settled by the decision in the case of the *Attorney-General v. Tett*, heard in the Exchequer Division in November 1876. Section 60 of the Stamp Act, 1870 provided that if a non-lawyer composed an instrument relating to real or personal estate or any legal proceedings in the expectation of earning a fee, he would be fined £50. The defendant in this case, Tett, was an accountant in London who, from 1874, conducted legal business under the title 'Hill & Co., solicitors'. In August 1874 Tett prepared a bill of sale and registered it in the name of a bona fide solicitor. The latter denied signing the bill. The alarm was raised and Tett failed to pay £50. The Crown therefore instituted proceedings. Tett was found guilty and ordered to pay the fine (*Law Times*, 2.12.1876:79–80).

This case was also significant to inter-professional relations between accountants and lawyers because during the proceedings, the Attorney-General expressed sympathy with the solicitors' claim that qualified men should be protected (*Law Times*, 2.12.1876:79; 23.12.1876:140; 30.12.1876:149; Walker, 2004b). The president of the Legal Practitioners Society considered that the verdict in *Attorney-General v. Tett* was 'a very great triumph', which would 'exercise a beneficial influence upon accountants, certain law stationers, and others who prepare such documents wholesale' (*Law Times*, 16.12.1876:123; 23.12.1876:140).

In the wake of *Attorney-General v. Tett* the Society of Accountants in England sought the opinion of counsel on the position of accountants vis-à-vis the Stamp and Solicitors Acts, and in particular 'What is the border line between the legitimate work of lawyers and accountants in work concerning the management of property, including trusteeships, especially where legal documents are prepared' (*Accountant*, 9.12.1876:4–5). In relation to the latter the opinion of counsel was that while accountants could prepare accounts and statements of affairs for creditors they could not draw up composition deeds and terms of arrangements in liquidation cases. The *Law Times* expressed satisfaction at this outcome but pointed to other documents where there remained ambiguity over which profession was responsible for preparation (6.1.1877:167).

The foregoing developments did not effect a definitive jurisdictional settlement over the preparation of instruments connected to insolvency.

Amendments to the Bill of Sale Act in 1878 were considered to have diminished the intrusions of unqualified persons but did not eliminate them (*Law Times*, 10.1.1880:191). During the 1880s accountants were still perceived as invading this terrain of lawyers (*Accountant*, 13.1.1883:6). In 1883 a Herefordshire lawyer complained that accountants continued to appear before the courts and issue summonses in place of solicitors. Hence, 'solicitors are daily being ousted and discredited by accountants and other unqualified persons who undertake solicitors' duties ... I can assure you that sect. 60 of the Stamp Act, inflicting a penalty of £50 on unqualified persons who for gain draw any instrument relating to real or personal estate, is everywhere systematically evaded and has become almost a dead letter' (quoted in *Accountant*, 15.12.1883:14; 15.3.1884:6; 9.7.1887:404; *Law Times*, 17.3.1883:362).

During the late 1880s complaints could also still be heard of accountants and others appearing before the courts representing clients as opposed to solicitors (*Law Times*, 10.9.1881:329; *Accountant*, 31.3.1888:202). Following a case in Taunton County Court in July 1891 which brought attention to the 'growing practice' of accountants issuing summonses, the Law Society successfully pursued litigation in the county courts against accountants (as 'unqualified persons') who performed the duties of solicitors (*Accountant*, 18.7.1891:545–546; 25.7.1891:553; 29.8.1891:618; 30.7.1892:602–604; 4.3.1893:190–191; 11.11.1893:948).

4.3. Organisation and settlement

Another potentially important player in the settlement of jurisdictional disputes is the professional organisation. Although he derogates studies of professionalism which focus on organisational structures, Abbott concedes that factors such as institutional cohesion are important to securing and consolidating jurisdictions (1988:82–84). He states that 'the existence of a single identifiable national association, is clearly a prerequisite of public or legal claims' (83, 107–108). The competition between accountants and lawyers for insolvency work reveals that organisation was not only significant to the pursuit of occupational claims, it was a key element in attempts at boundary definition.

4.3.1. Accountants, organisation and professional boundaries

The census of 1871 enumerated 9,832 accountants in England and Wales (Kirkham and Loft, 1993:557). The great majority of these did not become members of the organisations of accountants which were formed during the 1870s – the Incorporated Society of Liverpool Accountants (founded in 1870), the Institute of Accountants in London (1870), the Manchester Institute of

Accountants (1871), the Society of Accountants in England (1872) and the Sheffield Institute of Accountants (1877). In May 1880 these organisations boasted a total of only 638 members (Howitt, 1966:24; Boys, 2004). Despite the existence of a Society of Accountants in England and the metamorphosis of the Institute of Accountants in London to a national body in 1872, no single organisation represented the profession. Diffuse organisation and the small proportion of the population of accountants who were members had consequences for the definition of professional boundaries, occupational control and the negotiation and enforcement of formal settlements with other professions. The significance of the limited and fractured organisation of accountants for inter-professional relations was recognised by contemporaries. In 1874 *The Accountant* called for the formation of a national and united body of respectable accountants:

‘...Such an association would also tend to promote a better understanding between accountants and members of the legal profession, and would materially assist in the conduct of the business of both. It is becoming an absolute necessity that the distinction between lawyers and accountants should be more defined and known and that members of both bodies should be restrained within certain limits in practicing their profession’ (October, 1874:5).

A core problem for senior accountants in determining jurisdictional settlements with lawyers was the existence of pariah practitioners outside the control of professional organisations (Report of the Select Committee of the Companies Acts, 1877:23). The numerically dominant ‘so-called’ accountants were often perceived as representative of the profession as a whole.¹⁰ And, as illustrated in an earlier section, it was primarily the intrusive behaviour and charlatany of the unregulated class that irritated lawyers. In order to facilitate jurisdictional settlements with solicitors and address the problem of the so-called accountant professional practitioners were compelled to re-examine their organisational structures.

The Accountant recognised that the tendency to condemn all accountants in the law press confirmed the need for a thoroughly organised chartered accountancy profession ‘composed only of capable men, and enabled at once to put down pretenders’ (6.3.1875:2). Other commentators emphasised the need for accountants to ‘take some steps for clearly defining the status and responsibility of

the profession’ through organisation and state recognition (*Law Times*, 6.3.1875:326). The *Law Times* urged that a professional organisation be formed to address the problem of pettifogging accountants who ‘are constantly, and in large numbers, encroaching upon professional rights all over the country’ (quoted in *Accountant*, 16.2.1878:3; 23.2.1878:6; 10.10.1878:3–4; 21.12.1878:3). By the end of 1879 the *Law Times* was openly supporting legislative action to prevent the unfettered use of the title ‘accountant’ (13.12.1879:2–3).

Hence, when in spring 1879 the Institute of Accountants promoted a Bill for its incorporation and the formation of a single national organisation recognised by the state, it was suggested that the support of the law societies be sought (MS28408/3:243). The Institute’s Bill attracted favourable comment in the journals of the legal profession. Here was an attempt to address the long complained of incursion of soi-disant accountants into the domain of solicitors. The *Law Times* stated:

‘We hope that the accountants’ societies will procure this Act of Parliament, and, unless we are very much mistaken, it will then be seen that none of those persons who obtain County Court business by stooping to practices to which solicitors cannot lend themselves will be found to possess the statutory qualification of accountant’ (quoted in *Accountant*, 13.12.1879:8; 31.1.1880:10).

The Accountant expressed delight at the unusually favourable disposition of a lawyer’s journal towards accountants and confirmed that membership of an incorporation of accountants and the use of distinguishing initials would ‘draw lines of demarcation between persons who are, and persons who are not, properly speaking, “accountants”’ (31.1.1880:4).

Events transpired to prevent the passing of an accountants’ incorporation bill. However, in its place, state recognition was conferred by a Royal Charter in May 1880 (Walker, 2004b). This too, enabled some ‘weeding the profession of...so-called “accountants”’ (*Accountant*, 10.6.1882:4). The consequent formation of a single national organisation, the ICAEW, and the use by its members of defining credentials was well received by the law journals. The *Law Times* went so far as to recommend that as the public could now distinguish the bona fide accountant from the unscrupulous pretender it should be statutorily provided that eligibility for bankruptcy trusteeships be restricted to chartered accountants (14.8.1880:9). A decade later *The Accountant* reiterated the importance of organisation to jurisdictional settlement: ‘There is a legitimate sphere both for accountants and lawyers, and chartered accountants are justly cred-

¹⁰ For Abbott, addressing the public perception of the accountancy profession was futile as ‘the status hierarchy itself fluctuates freely without affecting the public image of the typical professional’ (1988: 121).

ited by their legal brethren with having a due and proper respect for matters which come within the province of solicitor' (27.9.1890 505).¹¹

4.3.2. Organisational rules on inter-professional matters

Organisations are also significant to the restoration of balance in Abbott's system due to their capacity to define inter-professional boundaries and formulate settlements through rule making. The following section discusses an attempt by accountancy organisations to determine boundaries by outlawing one dimension of the co-operative relationship between accountants and solicitors.¹² This was legitimised on the basis that such mutualism contradicted prevailing notions of professional independence and etiquette. At issue was not inter-professional task definition but modes of remuneration, and accountants' attempts to pursue the attributes of professionalism.

As revealed earlier, one feature of the close relationship between accountants and solicitors in insolvency administration was fee sharing. The practice of accountants handing over part of their remuneration to solicitors was deemed 'too widely prevalent' (MS2408/2:81–82). On 1 April 1873 the Council of the Institute of Accountants emphatically condemned 'agreements to pay to solicitors a certain portion of professional charges' (MS28405/1:115). Such practices were considered

derogatory, dishonourable and antithetical to professional independence. In January 1877 the Council of the Institute proposed to amend its rules such that profit sharing be regarded as unprofessional conduct and offenders liable to exclusion (MS28408/2:165–66; MS28405/1:265). It was hoped that the Law Society would adopt similar measures to outlaw solicitors who demanded a share of accountants' fees (MS28408/2:167–169). When the rule was adopted by the Institute in January 1877, its terms extended to cover other occupations employed by accountants such as auctioneers and brokers:

‘Any member who, directly or indirectly, shall allow or agree to allow of participation by a solicitor in the profits of his professional work, or shall accept or agree to accept from an Auctioneer, Broker, or other Agent employed upon the business of an Estate in the administration of which he or his Firm are engaged, any part or proportion of the charges payable to such Auctioneer, Broker, or Agent, shall be decreed to have been guilty of unprofessional conduct’ (MS28404:72, 80).

The Rules and Regulations of the Sheffield Institute of Accountants, adopted in May 1877, contained an almost identical rule (1877:12). It was considered that such regulations would be well received by the legal profession as illustrative of accountants' ‘endeavours to raise and sustain the standard of honour and professional conduct among accountants’ (*Sheffield and Rotherham Independent*, 13.6.1877:3). In October 1877 a general meeting of the Manchester Institute of Accountants endorsed a similar rule change (Minute Book:231–232). However, due to disagreements over its precise wording the rule was not adopted before the unification of the English accountancy organisations in 1880. The rules of the ICAEW prohibited accountants and solicitors from sharing fees (*Accountant*, 23.12.1882:3).¹³

5. Conclusions

While most previous commentators acknowledge the analytical power of Abbott's theory few depth studies, particularly in accounting, have found it totally convincing.¹⁴ Some researchers have been highly critical. Dezelay (1995:335) characterises Abbott's thesis of competing professions as Darwinist, as evocative of the law of the jungle rather than the behaviour of erudite and cultured professionals. Dezelay also criticises Abbott's limited recognition of the social and historical contexts in which inter-professional conflict is played out. Macdonald has argued that Abbott's amorphous 'system' is incapable of capturing the complexity of particular professional projects (1995:17).¹⁵ In relation to the interface between

¹¹ In contrast to the reaction of lawyers to the incorporation of accountants, Abbott (1988: 175) identified no instances of professions supporting each other's efforts to gain statutory protection.

¹² There was no statement in the original rules and regulations of the Institute of Accountants in London on inter-professional relations other than a provision that membership would *ipso facto* cease if an individual engaged 'in any other business than that of a professional accountant' (MS28407: 10). Rule 53 of the Manchester Institute provided that membership would be forfeited if a member pursued a 'business, profession, or employment incompatible with the position of a Member' (Rules and Regulations, 1871: 14). Articles of Association of the Liverpool Society stated that members could be expelled if accused and found guilty 'of any dishonourable, improper or unprofessional conduct' (Book of Laws, 1870).

¹³ Shortly after the Institute of Accountants decided that fee sharing constituted unprofessional conduct the subject featured in the wider political arena. In March 1877 the Institute wrote to Sir Edmund Beckett about his intention to present a Bill 'for the purposes of repressing the corrupt practice of agents sharing in the commissions payable to those they are instrumental in employing' and informed the Home Secretary of its measures to outlaw the practice (MS28405/1: 285–286, 315–317).

¹⁴ Abbott himself concedes that his framework may not be applicable to every situation (1988: 30–31).

¹⁵ In Abbott's defence it should be emphasised that his exploration of professional power recognises that occupational groups engage in political activity to protect jurisdictions. They do so by cultivating allegiances with socio-political and cultural elites and co-opting other allies to enhance jurisdictional claims (1988: 137, 173).

lawyers and accountants Sugarman (1995) has urged greater cognisance of the cultural and political contexts that incited conflict but also encouraged states of dependency. Only through a contextualised approach can the complexities of the 'uneasy relationship' between accountants and lawyers be captured (Napier and Noke, 1992).

In their analysis of the jurisdiction of the British accountancy profession during the late 20th century, Sikka and Willmott (1995) identified three other deficiencies in Abbott's theory: it constructs the arena of inter-professional competition as the nation state and thereby takes insufficient account of the increasingly global environment in which professional work and conflict are conducted; Abbott is weak in explaining instances where jurisdictions are challenged by belligerents not seeking to occupy them, and; his concept of jurisdiction is vague and tends to posit professions as homogenous entities.¹⁶

Another problem is Abbott's typology of jurisdictional settlements. In his Abbott-informed study

Richardson concluded that the conflict between management and financial accounting in Canada was not definitively settled and retained 'considerable ambivalence' (2002:117). This inter-professional arena remained 'the site of an unresolved jurisdictional dispute' which also defied Abbott's timeframe for the resolution of such contests. The extent to which jurisdictional disputes fail to result in decisive settlements has also been noted by historians of the legal profession. In his overview of lawyers in business Sugarman contends that: 'concentrating on jurisdictional conflict has its own limitations. Valuable though this approach is, it can portray jurisdictional battles in zero-sum terms, of clear-cut winners and losers, thereby exaggerating the extent to which work became dominated by a single profession and de-emphasizing the important ways in which competing professions cooperate and are interdependent' (1993:296). Abbott's own case studies are suggestive of this complexity – the definitive categorisations and 'terminal balances' presented in his theoretical excursus are not so prevalent when he examines particular jurisdictions in empirical depth. Here his language often shifts to temporary settlements and unfinished episodes (1988:215, 239).

The case presented in the current paper confirms that Abbott's determinate language of battles, revolutionary shifts and clearly defined jurisdictions understates the often multifaceted character of inter and intra professional discord, the transitional nature of changes in work and task, and the obscurity of jurisdictional boundaries. This study has concerned perhaps the most virulent period of jurisdictional conflict between accountants and lawyers – that incited by the Bankruptcy Act, 1869. This statute exacerbated competition between accountants and lawyers in insolvency practice which had been evident from the mid-19th century. The Bankruptcy Act, 1869 did not, however, result in monolithic groups of accountants and lawyers reverting to full scale warfare over the allocation of insolvency work. Most discontent appears to have been expressed by young, provincial solicitors against 'so called' accountants. At times the conflict between solicitors and accountants over the tasks of trusteeship, right to appear in court and the preparation of legal documents was vitriolic. Yet, behind the hostility vented in the professional press, were everyday relationships of mutual dependency.

Given the various dimensions of conflict and cooperation between accountants and lawyers during the 1870s and 80s it is not surprising that the settlement of jurisdictional claims should prove elusive and difficult to classify according to Abbott's generalised schema. While certain aspects of this typology resonate with the experiences of accountants and lawyers during the 1870s and 1880s, it

¹⁶ Sikka and Willmott (1995: 552–553, fn 12) also noted that some of Abbott's assertions about the emergence of the accountancy profession in the UK are disputable. They referred to these in relation to the emergence of joint stock companies and the acquisition by accountants of auditing work. Recent advances in historical scholarship also throw doubt on a number of Abbott's other claims. The notion that accountants engineered a seismic shift from insolvency work to corporate audit in the late 19th century (1988: 25–26) as improved management reduced insolvencies (94, 101) belie the complexity and transitional nature of shifts in clientele, the history of the corporate audit and the role of statutory change on insolvency practice (Markham Lester, 1995: ch. 7; Walker, 1993; Matthews et al., 1998: 30–36, 94–104). Further, the idea that the proliferation of professional organisations was symptomatic of excess demand for accountancy services (Abbott, 1988:25) understates episodes of oversupply, the practice of social closure by the earliest associations of accountants and the desire by the excluded to form their own organisations (Walker, 1988:40–66; Parker, 1986; Shackleton and Walker, 1998:3–6; Willmott, 1986). Students of the history of the profession in Scotland would object to the assertion that vocational preparation in the accountancy profession in Britain has been 'extrauniversity' (Abbott, 1988: 204) (Lee, 1996; Walker, 1988: 151–154; 1994). Assertions about chartered accountants surrendering cost and municipal accounting to subordinate professions (Abbott, 1988: 130, 148) and the increasing differentiation between public and industrial accountants (233) may be evidenced by the creation of separate organisations of cost and municipal accountants but they sit uneasily with the way in which chartered accountants were increasingly employed in industrial and governmental institutions, particularly after 1918 (Walker, 2000; Matthews et al., 1998). Students of the proletarianisation of accounting functionaries (Cooper and Taylor, 2000; Kirkham and Loft, 1993; Wootton and Kemmerer, 1996, 2000) are more circumspect than Abbott about the singular impact of calculating machines on the creation of a division of labour between accountants and bookkeepers (Abbott, 1988: 228). Historians of the dissemination of costing techniques would contest Abbott's claim about the dearth of costing activity before the early 20th century and his bold assertion that Hollerith machines 'created, virtually overnight, the field of cost accounting' (1988: 228, 233; Fleischman and Parker, 1997).

does not fully capture the complex character of attempted settlements, the mechanics of their working out and the extent to which 'balance' was not fully achieved. Though in some respects the episode discussed here was akin to Abbott's (1988:73-74) drawn contest where the determination of a division of labour is gradual, the maintenance of balance is difficult and jurisdictional boundaries remain obscure. Hence, in the last decade of the 19th century some lawyers still complained about the intrusions of accountants, and accountants complained of the 'several solicitors whose practice lies more in ledgers than in the law' (*Accountant*, 6.8.1892:608).

An informal division of labour between accountants and lawyers over insolvency trusteeships was effectively worked out to the advantage of accountants but their domination was weak and vulnerable. Attempts by lawyers to secure a settlement by statute proved unsuccessful. The interpolation of the state in the form of a Bankruptcy Act, 1883, both complicated and prolonged attempts at statutory settlement. The government encouraged open competition for insolvency appointments and both accountants and lawyers secured a share of available official posts. Inter-professional disputes over the distribution of bankruptcy work continued into the twentieth century. Court decisions went some way to define responsibility for the preparation of legal documents and inspired accountancy organisations to seek legal opinion on the territorial delimiters between accountants and solicitors. However, these settlements too, were not characterised by conclusiveness or clarity.

Neither is Abbott's timescale for system adjustments strongly supported here. He contends that 'Jurisdictions are renegotiated in workplaces over two- to three-year periods, in public over ten-to-twenty year periods, in the law over twenty- to fifty-year periods' (1988:135). The case of accountants and lawyers shows that the transformation of a jurisdictional dispute was heavily conditioned by legislation, the timing of which was determined by wider discourses on public policy making, changes of government and parliamentary time-tabling.

A final observation may be made concerning studies of professionalism. Contrary to Abbott's derogation of foci on professional organisations,¹⁷ these institutions were important in attempts to secure inter-professional settlements. First, the incomplete and disparate organisation of professional accountants during the 1870s and the presence

of a significant unaffiliated community of so-called accountants disrespectful of professional territories, was considered an impediment to the resolution of conflict between lawyers and accountants. The formation of a single Institute of Chartered Accountants in England and Wales in 1880 was welcomed by lawyers for its potential to address this problem. Organisation institutionalised *occupational* difference and rendered negotiation feasible. Second, the accountancy organisations formulated rules that directly addressed inter-professional issues. In this instance, however, the object was not to arrest conflict between accountants and lawyers over task but the fracturing of a source of mutualism: fee sharing. This practice was deemed offensive to contemporary notions of professional ideals and morality.

The findings reported in this paper are confirmatory of earlier studies of accountants and lawyers which suggest that inter-professional relationships were characterised by both conflict and co-operation. The study affirms the value of Abbott's theoretical synthesis in *The System of Professions* and the potency of analyses that focus on work. However, the study also reveals that detailed, contextual studies of inter-professional relations tend to reveal a more complex picture, not easily accommodated within definitive processes of disturbance, jurisdictional competition and settlement.

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Book reviews

Performance Reporting by UK Charities: Approaches, Difficulties and Current Practice. Ciaran Connolly and Noel Hyndman. Institute of Chartered Accountants of Scotland, Edinburgh, 2003. xx + 144 pp. ISBN 1-871-250-978. £15.

The charity sector of the UK has assumed an increasing importance in recent years. In part, this growing importance is a reflection of the intent, and the policies, of successive Conservative governments to roll back the state and thereby create opportunities to fill gaps in service provision which were formerly provided by the public sector. Other government policies have extended this phenomenon, most notably 'New Labour's' emphasis on public-private partnership in which there is considerable scope for voluntary bodies to work closely with public sector bodies.

In addition to these wider influences, there is an impressive momentum to the scale of charity activity within the UK which is fuelled by the aspirations, emotions and commitment of many individuals who are frustrated by the activities of the public and the private sectors and who see the need to start charities to address these perceived weaknesses of the private and state sectors of the economy. This phenomenon of highly committed individuals with 'missions' draws in other members of communities who may give freely of their time and resources to further the mission of these entities.

What has this set of events got to do with accounting? Well, there is already a significant body of literature which has investigated these entities. The particular perspective that this literature has addressed is that of (non)compliance, mainly with prescribed guidance on how such entities should account. The general finding of highly variable compliance is related to the heterogeneity of this sector, with significant differences in scale and managerial and financial expertise. The present study can be seen as an extension of this existing body of literature. This report goes beyond 'financials' to address issues of non-financial performance measurement. This in itself is a valuable contribution to the literature, extending our knowledge of a new world for charities in which reporting on performance becomes routine.

The perspective taken in this study is that of the 'user needs' method. This method of analysing the merits of accounting information has been criti-

cised in the literature as being somewhat elusive, with limited substantive evidence which substantiates the idea of some kind of hierarchy of user needs. Even so, the authors do use this model well and tease out the kind of information which might be of use to citizens and other interested parties. The authors offer a useful review of the accounting literature and present an accessible and interesting discussion of the thorny problem of performance measurement in not-for profits.

This discussion extends beyond the general to include some detailed and specific examples of different kinds of performance calculator that have been used in the public sector, as a reference point.

The actual study is based on a survey of charities for annual reports and accounts and related information. This allowed the authors to analyse this information from a number of perspectives (nature of governance, constitution of the charity, reviews, levels of explanation of information provided). The authors then proceed to analyse the levels of performance information reported upon in these accounts. Their study revealed slight declines in level and detail of information reported upon over the period 1997-2001. The study has some excellent observations of the manner in which different charities have reported upon 'performance'. This is identified by the authors as a major challenge for the future accountability arrangements of charities.

I found this study useful and informative. However, two further different perspectives were obtained by this author. First, the students in this writer's honours seminar read and commented on this report. They understood the issues raised (a tribute to the lucidity of this series of research reports), and also enjoyed reading it. The students' response was also influenced by a practitioner perspective on this report, in which local practitioners specialising in charity work stressed the importance of this publication.

University of Edinburgh

Irvine Lapsley

The Future of Corporate Governance: Insights from the UK. Ian Fraser and William Henry. The Institute of Chartered Accountants of Scotland, 2003. ISBN 1 871250 99 4.

This report details the findings of a major research project into the future of corporate governance and

the external audit function in the UK context.

It is a particularly interesting study as it builds on earlier work published by ICAS (1993), *Auditing into the Twenty-first Century*. The decade spanned by this period of time (1993–2003) has seen a change in the public perception of corporate governance. It has also witnessed the publication of a veritable feast of corporate governance codes in the UK, and elsewhere. While the Cadbury Committee (1992) report laid the foundations for corporate governance in the UK, more corporate governance committees followed, including the Greenbury and Hampel Committees, and in 1998 the UK Code of Corporate Governance was issued.

In 1999 the ICAEW published guidance for directors and internal control (commonly known as the Turnbull Report) and several other reports followed including the Smith (2003) report on audit committees; and the Higgs (2003) review of the role and effectiveness of non-executive directors. A revised Combined Code (2003) was issued in July 2003 to take account of these reports and corporate governance developments. Financial collapses and scandals such as Enron, Royal Ahold and Parmalat have served to ensure that corporate governance retains a high profile.

This report weaves together a number of fascinating strands. First, it summarises the changes to audit and corporate governance arrangements proposed by ICAS in 1993. These proposals included, *inter alia*, enhancing the internal audit function of each listed company; establishing Financial Reporting and Audit Committees (FRACs) made up entirely of non-executive directors for each company; external auditors to be renamed external assessors to reflect the implications of the establishment of FRACs; and the establishment of an Audit Review Panel (ARP) to appoint and set the remuneration of the external assessors. Interestingly these proposals were, the authors stated, ‘paralleled by contemporary practice in the areas of audit and corporate governance within the Netherlands’. The authors therefore looked in depth at the situation in the Netherlands and reported on this in 2000, at the same time producing revised proposals that built on the ICAS (1993) proposals.

The second strand is a review of the current literature on corporate governance and key issues arising there-from. This is used to frame the research objectives for the main study: to identify and explore the views of various stakeholder groups on contemporary and future corporate governance issues, and on the proposals made by Fraser, Henry and Wallage (2000) and ICAS (1993); and to form a view on the desirability and feasibility of implementing those proposals. To this end a postal questionnaire of 1,000 ‘interested

parties’ was carried out, as were interviews.

Their findings revealed widespread support for the establishment of an internal audit function or an alternative process, to ensure directors are in a position to fulfil their responsibilities in relation to the control of risk management. However, there was little support for renaming the external auditors as external assessors, nor for the establishment of audit review panels. On the other hand, there are three new proposals relating to addressing the shortage of suitably qualified non-executive directors and the idea that shareholder committees should be established to allow shareholders a more formal role in corporate governance.

Overall, the report is a stimulating read and highlights the way that corporate governance has developed in the past decade, while emphasising areas that still require considerable attention such as the role of internal audit, and the problems of ensuring a ready supply of suitable non-executive directors.

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University of Birmingham

Chris Mallin

Management Accounting – Feed Forward and Asian Perspectives. Akira Nishimura. Palgrave Macmillan, UK 2003. x + 179 pp. £50.

This is a novel and intriguing text, which is well worth a place on the shelves of those involved in management accounting research, education and practice. It provides something significant for all these constituencies in its blend of theory and practice, Eastern and Western ideas and cases, and in the author’s proposals for developing the discipline. It is written in a discursive style that draws

on the lengthy experience of its distinguished author, and this approach generates a thoughtful and thought-provoking book.

It is based on the idea that traditional feedback control systems have serious limitations. They do provide a basis for leisurely ex-post appraisal of performance in respect of accountability assessments but as contributors to performance improvement they have the disadvantages of not allowing 'enough time to rectify errors'. The solution is to develop management accounting systems which support a feedforward approach. Management accounting information should help management be proactive rather than reactive. This orientation has a great significance for the organisational role of management accounting. It should support horizontal two-way communication as opposed to the more traditional one-way vertical. In this way it can provide a more constructive service which enhances co-operation, consensus and joint working in pursuit of organisational objectives.

The simultaneous pursuit of effectiveness (quality) and efficiency (cost) is also highlighted as a major purpose of management accounting. The process of target costing (more appropriately translated as cost design) is presented as the means by which Japanese companies have achieved these twin objectives. The text demonstrates through several cases not only the various mechanics of deriving cost targets, but also the incredibly intensive efforts which go into meeting it. These include extensive design stage involvement as well as continuous improvement efforts throughout the

manufacturing life of the product. The costing information detail is extraordinary, with cost-per-second calculations used and book-keeping systems amended to formally record and identify cost reduction achievements.

The teamwork and horizontal networks involved in these activities are pinpointed as the characteristics of the Japanese situation that are difficult to replicate in non-Asian cultures. Indeed, the author suggests that the international portability such as target costing are compromised by their nature and development to match the Japanese context.

While the feedforward approach is inherent in target costing, it is also to be found in the West in the work of Demski on the separation of planning and operational variances. Indeed, the author considers that this work has 'contributed most to the development of management accounting theory in the twentieth century'. In Demski's planning variance and in the regular determination of optimum performance, he sees the foundation for feedforward systems based on the more traditional Western standard costing. However, Demski's ideas have never taken a significant practical hold, and the challenges to his approach suggested by critics such as Lloyd Arney are not addressed. It would have been interesting to know the author's view on these.

To sum up, this is an excellent, if concentrated, read with plenty of material to stimulate thinking and to enrich teaching.

University of Edinburgh

Falconer Mitchell

Special section of
European Accounting Review
on
Conservatism in Accounting

Guest editors: James A. Ohlson and Laurence van Lent

CALL FOR PAPERS

Accounting tends to underestimate the net assets on the balance sheet and to defer the recognition of gains in the income statement while losses are booked immediately. In short, accounting is conservative. Extant research suggests that accounting conservatism varies among firms, industries and countries and is much influenced by the specific institutional settings facing management. Nevertheless, accounting conservatism is still ill understood and many questions remain.

European Accounting Review will issue a Special section to further understanding of these important questions. Relevant topics include, among other things:

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Submitted papers considered for this special issue will be subject to double-blind review. Authors are encouraged to contact the guest editors in advance should there be any matters on which they require clarification or guidance. Submissions should be sent to the address shown below in electronic format (Word or pdf). The deadline for submissions is **1 July 2005**.

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Papers should be in English and consist of original unpublished work not currently being considered for publication elsewhere. They should be typed and double-spaced. Four copies should be submitted, together with a submission fee of £18 for subscribers or £36 for non-subscribers. The submission fee should be paid by cheque or draft made payable to *Lancaster University*. Payment cannot be made by credit card. In order to ensure an anonymous review, authors should not identify themselves, directly or indirectly. Experience has shown that papers that have already benefited from critical comment from colleagues at seminars or at conferences have a much better chance of acceptance. Where the research takes the form of field surveys or experiments, four copies of the instrument should be submitted. Where the paper shares data with another paper, a copy of the other paper must also be provided. In the case of papers accepted for publication, authors will be asked to provide a Word file of the manuscript on CD or floppy disk, along with a hard copy version. Authors of accepted papers will also be asked to transfer copyright to the publishers.

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Tippett, M. and Whittington, G. (1995). 'An empirical evaluation of an induced theory of financial ratios'. *Accounting and Business Research*, 25: 208–218.
Watts, R. L. and Zimmerman, J. L. (1986). *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice-Hall.

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Abbreviations of institutional names should be written as, for example, FASB and not F.A.S.B.; those of Latin terms should contain stops (thus i.e. not ie). Words such as 'realise' should be spelled with an 's' not a 'z'. Single quotation marks should be used, not double.

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Mathematical notation should be used only where it adds rigour and precision, and should be properly explained in the text. Equations should be numbered in parentheses, flush with the right-hand margin.

Accounting and Business Research

SPECIAL ISSUE ON ACCOUNTING AND VALUATION

**Linear information dynamics, aggregation, dividends
and 'dirty surplus' accounting**

**'Equity smirks' and embedded options: the shape of a
firm's value function**

**Implied cost of equity capital in earnings-based
valuation: international evidence**

**Discussion of 'Implied cost of equity capital in
earnings-based valuation: international evidence'**

**Predicting firm value: the superiority of *q*-theory over
residual income**

**Discussion of 'Predicting firm value: The superiority of
q-theory over residual income'**

Dirty surplus accounting flows: international evidence

**Discussion of 'Dirty surplus accounting flows:
international evidence'**

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Guest editorial to international conference on advances in accounting-based valuation

Miles Gietzmann, Cass Business School

On publication of his 1995 framework paper, Jim Ohlson reinvigorated academic research in accounting by providing a well-articulated argument to explain why accounting-based valuation was equivalent to the traditional finance approach based on dividend (cash flow) streams. Not surprisingly, this work, and also his following work with Gerry Feltham and other authors, resulted in many empiricists utilising the framework to test for the value-relevance of accounting variables.

While many agreed this work was seminal, it was also controversial on both theoretical and empirical grounds. For instance, at the time of introduction the predominant theoretical paradigm for accounting research was agency theory, and Jim's early work did not incorporate a clear model of managerial behaviour. In such a formulation there was no role for central agency considerations, such as asymmetric access to information, and pay-for-performance contracting. In addition, it became apparent that some attempted empirical implementations of Jim's theoretical model specification made somewhat heroic assumptions, which some have argued were not consistent with the essential spirit of the Ohlson or Feltham-Ohlson frameworks.

Jim presented the opening paper in the conference. He noted that many of the models inspired by the Residual Income model can be derived from one mathematical result which he referred to as the Fundamental Principle. The Principle is based on a linear state-space representation of the dynamics of the firm with three state variables: (i) an externally observable retrospective (accounting) variable, (ii) an externally observable dividend and (iii) a prospective (information) variable. The submatrix specifying the evolution of the accounting variable and the information variable is assumed to have externally known entries, but the dynamic (aka the dividend policy) generating the future dividend variable from the observed state, though assumed linear, is presumed to be initially unknown to an external observer. The paper identified uniquely the properties of the linear model, in

terms of the accounting variable in use, under which the Dividend Irrelevancy Principle subsists unconditionally in this setting. However, it left as unidentified the properties of a general multi-variable linear state-space system of accounting under which Dividend Irrelevancy would subsist.

The remaining papers in this conference can be classified neatly according to the two respective critiques of the second paragraph. The papers by Isidiro, O'Hanlon and Young (IOY), and by Chen, Jorgensen and Yoo (CJY), explore empirically some of the implications of dirty surplus accounting. Both papers take an international perspective. This is motivated by a desire to utilise a data set for which there is a variation in the independent variables resulting from different practices across countries. The discussants Pascal Frantz and Marco Trombetta outline the respective insights that the analysis of these rich data sets gives rise to, while at the same time providing cautionary comments on the limitations of these approaches. In this respect it is perhaps interesting to note that in a recent article in *The Financial Times* (9 February 2004), Dan Roberts argued that the accuracy of analysts' profits-forecasts has hit a record low. Hence, perhaps we should increasingly start to be concerned about empirical methodologies that depend so critically on analyst-consensus forecasts as the prime estimator for firm value.

The remaining two papers take an alternative tack, concentrating upon the theoretical framework underlying the Ohlson model. The first time I saw a presentation of the Ohlson model, I was mistakenly under the assumption that the equivalence result – between discounted dividends (and associated cash flows) and the book value-plus-discounted residual income model of Ohlson – was the unique mapping of dividend-based valuation into accounting-based valuation. This of course was false; residual income is only one way, via the clean surplus relationship, to establish equivalence between two forms of valuation practice. With this latter observation in mind, it becomes apparent that the application of residual income was not

necessary to guarantee that accounting was consistent with the traditional finance approach. Many other forms of accounting may also admit equivalence, and hence one must take great care not to make any statements, or pose empirical tests, which assume residual income is necessary for equivalence.

While it is true that the Ohlson method, relying on an AR(1) process assumption for updating, provides a particularly compact, intuitive and tractable method, this simplifying assumption is also at the heart of one of the major limitations of the approach. As earlier reviews, such as Lo and Lys (2000),* make clear and, as is further developed in the papers by Ashton, Cooke, Tippett and Wang (ACTW) and by Gietzmann and Ostaszewski (GO), the Ohlson approach implicitly requires a very restrictive underlying form of inflexible investment policy. Expressed alternatively, both papers ask searching questions about the lack of a clearly defined, or overly restrictive, role for management within the traditional Ohlson framework. That is, one can have the compact, in-

tuitive, tractable model if one wants, but this comes with a cost, that it may hardly ever (except in special circumstances) be descriptive of equilibrium managerial behaviour, and hence by implication of empirical practice.

Both the ACTW and GO models try to remedy this problem by having management consideration of investment options at centre stage. Neither of these two models is quite as accessible as the Ohlson framework, and further work needs to be conducted to clarify their empirical implications. Interestingly, the discussants Adam Ostaszewski and John O'Hanlon respectively comment on this latter issue in quite contrasting manners. The former discussant provides a lengthy discussion of how the ACTW model can be generalised and extended, whereas the later discussant questions whether the additional mathematical formalisation, and closer attention to modelling managerial behaviour, really adds much.

While the papers have advanced our understanding, much work still needs to be done to establish the theoretical foundations of financial accounting information in a manner which would lead to far more sophisticated empirical testing of accounting relevance.

* Lo, K. and Lys, T., (2000). 'The Ohlson model: contribution to valuation theory, limitations and empirical applications'. *Journal of Accounting Auditing and Finance*.

Linear information dynamics, aggregation, dividends and ‘dirty surplus’ accounting

David Ashton, Terry Cooke, Mark Tippett and Pengguo Wang*

Abstract—We generalise the Ashton et al. (2003) Aggregation Theorem by demonstrating how the market value of equity disaggregates into its recursion and real (adaptation) components when the linear information dynamics incorporate a dirty surplus adjustment and also, when dividends are paid. Our analysis shows that ignoring the dirty surplus adjustment will, in general, induce biases into the functional expressions for the recursion and real (adaptation) values of equity. Furthermore, we show that whilst the recursion value of equity is independent of dividend policy, the real (adaptation) value of equity is affected by the dividend policy invoked by the firm. Tabulated results show that the difference in equity value between a dividend and a non-dividend paying firm is most pronounced at low levels of the recursion value.

1. Introduction

There is now a steadily growing volume of papers that although notionally based on the dividend discount model, express the value of a firm's equity in terms of information variables other than dividends. These information variables typically include earnings and the book value of equity. Furthermore, modelling procedures in this area are invariably based on the clean surplus identity; an equation that links a firm's information variables to the dividend payments which it makes. These information variables are normally assumed to evolve in terms of a first order system of stochastic difference equations which, when solved, can be used to determine the expected stream of future dividends and thus, the market value of the underlying equity security. Unfortunately, recent developments in investment theory show that the expected present value rule (on which the dividend discount model is built) is based on some tenuous assumptions and that because of this, is unlikely to give a complete picture of the way equity prices emerge in practice (Dixit and Pindyck, 1994; Trigeorgis, 1996; Holthausen and Watts, 2001:60).

The principal problem with the expected present value rule is that it assumes a fixed scenario under which firms implement their investment opportunities and then go on to generate a stream of cash flows without any intervening contingencies. Thus contingencies, like a firm's ability to modify or even abandon its existing investment opportunity set in the face of unfavourable market conditions, have no role to play when investment decisions, and by implication equity value, are based exclusively on the expected present value rule. Yet a firm's ability to adapt its investment opportunity set to alternative uses represents a potentially valuable option that will be reflected in the market value of its equity, and this will be over and above the value that emanates from discounting the stream of future dividends it expects to pay (Dixit and Pindyck, 1994; Trigeorgis, 1996; Holthausen and Watts, 2001:60).

Unfortunately, there are few examples in the literature where these option values are included as components of equity valuation models. Notable exceptions are the papers by Burgstahler and Dichev (1997), Yee (2000) and Ashton et al., (2003). In the first of these papers, Burgstahler and Dichev (1997:188) argue that equity value is comprised of two elements. The first is called the recursion value of equity. This is the expected present value of the stream of future dividends computed under the assumption that the system of stochastic difference equations that describe the evolution of the firm's information variables, will remain in force indefinitely. Following Burgstahler and Dichev (1997:192) we shall henceforth define the system of stochastic difference equations which govern the evolution of the firm's informa-

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tion variables and thus of its dividends, as the firm's investment opportunity set or alternatively, its business technology.¹ The second component of value is called the real (adaptation) value of equity. This is the option value that arises out of the fact that the firm can terminate (or amend) its current investment opportunity set by (for example) changing the nature of the capital projects in which it invests. Unfortunately, Burgstahler and Dichev (1997:188) have little to say about how this component of equity value is determined other than to suggest that the book value of a firm's equity might be a reasonable approximation for it.

More rigorous approaches to this issue can be found in the papers of Yee (2000) and Ashton et al. (2003). Yee (2000) considers a firm with a single capital project whose 'excess (book or accounting) earnings' in the first year of its operation are drawn from a probability distribution with compact support. These excess earnings then decay in an exponential and deterministic (or known) manner until (at one of a countably infinite number of points in time) the firm abandons the capital project in favour of a potentially, more profitable project. Yee (2000) shows that under this scenario the real (adaptation) value of equity will be a monotonic decreasing function of the excess earnings figure. Ashton et al. (2003) draw on ideas contained in both the Burgstahler and Dichev (1997) and Yee (2000) papers. However, Ashton et al.'s (2003) analysis is cast in continuous time and makes full use of the analytical tractability provided by the burgeoning real options literature based on these continuous time methods. Here they focus on the simple capital investment models of Dixit (1989) and Dixit and Pindyck (1994:185–186), which they adapt to accommodate the first order system of stochastic differential equations on which their analysis is based. In contrast to the Yee (2000) model, Ashton et al. (2003) use a full set of accounting and information variables all of which evolve stochastically through time. When no dividends are paid and the clean surplus identity holds, Ashton et al. (2003) demonstrate that the real (adaptation) value of equity may be written as the product of two terms, one of which is the recursion value of equity whilst the other is a variable factor itself dependent on the recursion value. Furthermore, they obtain closed form expressions for both the recursion value and the variable factor that depends on it.

Our purpose here is firstly, to generalise the

Ashton et al. (2003) Aggregation Theorem by removing its dependence on the clean surplus identity and then secondly, to allow for the payment of dividends (Black, 1976; Miller, 1986; Soter, 2001; Akbar and Stark, 2003). Here, our analysis shows that ignoring dirty surplus adjustments can lead to systematic biases that, in empirical work, will translate to an omitted variables problem (Greene, 1997:402–404). Our analysis of this issue is based on two 'dirty surplus' propositions. The first of these shows how the recursion value of equity is determined when the clean surplus identity does not hold; that is, when there is a form of dirty surplus accounting. The second proposition outlines how the system of stochastic difference equations on which the valuation models of this area have traditionally been based is modified so as to account for the dirty surplus adjustment. Through this we assess the nature of the systematic biases that can emerge in both the recursion and real (adaptation) values of equity if the dirty surplus adjustment is ignored. We then move on to assess the impact that dividend payments can have on the Ashton et al. (2003) equity valuation formula. In common with results reported in the real options literature, our analysis shows that while the recursion value of equity is independent of a firm's dividend policy, its real (adaptation) value will in general be affected by its dividend policy (Dixit and Pindyck, 1994:154). Against this, our analysis also shows that, for parsimonious dividend payout assumptions (e.g., dividends proportional to the recursion value of equity), the 'structure' of the equity valuation problem is similar (although with some important differences) to the no-dividend case examined in the Ashton et al. (2003) paper.

In the UK, FRS3: *Reporting Financial Performance* has severely curtailed the practice of dirty surplus accounting. There have been similar developments in relation to the practice of dirty surplus accounting in the US (O'Hanlon and Pope, 1999:460–461). Hence, the next section begins by briefly examining why we ought to be concerned with the problem of valuing equity in the presence of dirty surplus adjustments.

2. Dirty surplus accounting

Our principal objective is to generalise the Ashton et al. (2003) analysis by removing the requirement for the clean surplus identity to hold and also, to allow for the payment of dividends. While the extension to dividends requires little justification, removing the requirement for the clean surplus identity to hold is more problematical. Given this, we now briefly assess the potential firms and individual investors have for practising dirty surplus accounting under the accounting standards in force in the UK and US.

¹ This system of stochastic difference equations is also often referred to as the 'linear information dynamics' that underpins the model. We shall henceforth use the terms 'system of stochastic difference equations', 'linear information dynamics', 'investment opportunity set' and 'business technology' interchangeably.

2.1. Dirty surplus accounting practices

We begin by noting that, for UK firms, FRS3 requires that, with few exceptions, all gains and losses must pass through the profit and loss account (Deloitte & Touche, 2002:225). Despite this, FRS3 still requires reporting entities to make (and disclose) certain 'adjustments' to the operating profit (or loss) for the year before determining the headline profit (or loss) disclosed in its financial statements. These include:

- (a) profits or losses on the sale or termination of an operation;
- (b) costs of a fundamental reorganisation or restructuring having a material effect on the nature and focus of the reporting entity's operations; and
- (c) profits and losses on the disposal of fixed assets.

Under SSAP6: *Extraordinary items and prior period adjustments*, which was withdrawn when FRS3 was issued, adjustments like these would probably have been disclosed as extraordinary items (Deloitte and Touche, 2002:256–257). This is clearly implied by FRS3, which requires that the information disclosed about these items must be sufficient to enable an informed reader of the financial statements to be in a position to make their own judgement about how each of these items ought to be treated. In particular, the additional information provided about these items must be such as to allow users to make the necessary adjustments to earnings per share (EPS) if the treatment of any item is different from the one that they prefer (Deloitte & Touche, 2002:256–257). This effectively invites users of financial statements to exclude items from the published profit or loss about which they feel 'uncomfortable', thereby resurrecting a form of 'personal' dirty surplus accounting.

There are in addition to these, however, exceptions that FRS3 makes to the general requirement for all components of an entity's financial performance to flow through the profit and loss account. These exceptions must be disclosed in a complementary statement to the profit and loss account called the 'statement of total recognised gains and losses'. While FRS3 does not discuss what it means by 'gains' and 'losses', it does provide illustrative examples of the kind of items that may be included in this statement. These include

the headline profit or loss before deduction of dividends, plus the following:

- (a) adjustments to the valuation of assets; and
- (b) differences in the net investment in foreign enterprises arising from fluctuations in exchange rates.

Hence, for these and similar items, FRS3 endorses a form of dirty surplus accounting.

In the US, APB Opinion No. 30: *Reporting the Results of Operations* requires that extraordinary items, prior year adjustments and discontinued operations should be shown separately (net of income tax) after income from continuing operations. Extraordinary items must be unusual in nature and occur infrequently. In effect, unusual in nature suggests that the event or transaction should not be normal and unrelated to the ordinary activities of the business. Consideration should also be given to the nature of the business, extent of operations and policies relating to that business to ensure that the event or transaction should not be expected to recur. In addition to the general guidance provided, Opinion No. 30 states that certain items are extraordinary even though they may not meet the above criteria. These include material gains from the extinguishment of debt (SFAS No. 4), profit or loss from the disposal of a significant part of assets or separate segment within two years of a pooling of interests (APB Opinion No. 16), the write-off of operating rights of motor carriers (SFAS No. 44), and the investor's share of an extraordinary item in an associate when the equity method is applied (APB Opinion No. 18). Finally, SFAS No. 130: *Reporting Comprehensive Income* requires that any changes in book value of equity which are excluded from Net Income (e.g., prior period adjustments), must be reported as 'Other Comprehensive Income' in a statement of total recognised gains and losses similar to that required under the UK accounting standard, FRS3.

In practice, a problem that has occurred in the US, as well as the UK, is that exceptional items have become frequent. For example, companies have not always amortised intangibles but written them off as 'impairment charges' and treated them as exceptional items. In the US this has been permissible since the introduction of SFAS No. 142: *Goodwill and Other Intangible Assets*, in June 2001.² An incentive for such an approach is that often bonuses paid to senior management are based on profits before exceptional items. Furthermore, earnings per share (EPS) of publicly listed US companies must be disclosed on the face of the income statement (SFAS No. 128) and be based on income from continuing operations. In addition, EPS should be shown on the basis of income before extraordinary items and the cumulative effects of changes in accounting principles.

² See Zeff (2002: 51–53) for a short history of the 'politics' leading up to the promulgation of SFAS No. 130: *Reporting Comprehensive Income* and SFAS No. 142: *Goodwill and Other Intangible Assets*. Penman (2003: 86–87) provides some 'interesting' examples of how these standards have been applied in practice.

The difference between the first and second EPS figures is discontinued operations. Once the second earnings figure has been disclosed it is necessary to deduct extraordinary items and the cumulative effect of changes in accounting principles to arrive at net income and EPS on this basis.

Our brief summary of accounting standards relating to the reporting of results from operations and financial performance in the UK and US indicates that there are opportunities, both directly and indirectly, for firms to practise various forms of dirty surplus accounting (Penman, 2003:82). This, combined with the fact that the presentation of certain items in the income or profit and loss statement are such that users can make their own judgments about how they should be presented, is taken as sufficient justification for extending the Ashton et al. (2003) analysis to encompass dirty surplus accounting. We begin our analysis with the two crucial theorems that underpin most of our analysis.³

2.2. Dirty surplus propositions

We define $b(t)$ as the book value of equity, $x(t)$ as the instantaneous accounting (or book) earnings (per unit time) attributable to equity and $\epsilon(t)$ as the instantaneous 'dirty surplus' adjustment (per unit time), all at time t . It then follows that the instantaneous increment in the book value of equity, $db(t) = b(t + dt) - b(t)$, over the interval from time t until time $t + dt$, will be $db(t) = (x(t) + \epsilon(t))dt - dD(t)$. Here, $D(t)$ is the accumulated dividends paid over the (semi-closed) time interval $[0,t)$.

³ Holthausen and Watts (2001: 47–48) summarise current American practice in this area by noting that in general '... Anglo-American accounting has not been characterized by clean surplus [accounting]. Items other than income and transactions with shareholders are involved in the calculation of the change in the book value of equity The magnitude of dirty surplus appears to be material in many cases. Lo and Lys (2000) estimate the amount of dirty surplus as the absolute difference between comprehensive (clean surplus) income and GAAP net income as a percentage of comprehensive net income in the period 1962–1997. They find that while the median deviation is only 0.40 [of one] percent, the mean is 15.71 and 14.4 percent of firm/years having a dirty surplus that exceeds 10 percent of comprehensive income.' Likewise, Tippett and Warnock (1997: 1,094) employ a maximum likelihood procedure to show that it is most unlikely the clean surplus relationship holds in the United Kingdom.

⁴ Recall that the system of stochastic difference equations or equivalently, the linear information dynamics that govern the evolution of the firm's bookkeeping and other information variables, is defined as the firm's 'business technology' or its 'investment opportunity set'.

⁵ If one dislikes the restrictions imposed by these quasi-general equilibrium models, one can always follow Dixit and Pindyck (1994: 185) in using 'dynamic programming with an exogenously specified discount rate ... although we will [then] not be able to relate this discount rate to the riskless rate and the market price of risk using the CAPM.' Alternatively, one could use the 'equivalent martingale' theory of Harrison and Kreps (1979: 383) to define i as the riskless rate of interest.

From this it follows that $dD(t) = D(t + dt) - D(t)$ represents the dividend payment made at time t . Now, recall that the recursion value of equity, $\eta(t)$, is the expected present value of the stream of future dividends computed under the assumption that the firm's existing investment opportunity set will remain in force indefinitely, or:⁴

$$\eta(t) = E_t \left[\int_t^\infty e^{-i(s-t)} dD(s) \right]$$

where $E_t(\cdot)$ is the expectations operator taken at time t and i is the cost of capital (per unit time) applicable to equity. Present value expressions like the one formulated here are probably most easily rationalised in terms of the quasi-general equilibrium approaches to valuation theory of which Rubinstein (1974:235) is as good an example as any.⁵ However, in whichever way the above expression for $\eta(t)$ is justified, it can always be used to link the expected present value of a firm's dividends to its bookkeeping and other information variables by using the following result:

Theorem #1

Let $a(t) = x(t) - ib(t)$ be the instantaneous residual income or abnormal earnings (per unit time) and $\epsilon(t)$ be the instantaneous dirty surplus adjustment (per unit time), both at time t , given that the firm applies its existing investment opportunity set indefinitely into the future. Then the recursion value of equity can be restated as:

$$\eta(t) = b(t) + E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] + E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right]$$

which is the book value of equity plus the sum of the expected present value of the residual income stream and the expected present value of the stream of dirty surplus adjustments, all taken at time t .

Proof:

See Appendix.

Note that this result exhibits one crucial difference when compared to the 'equivalent' formulation based on the clean surplus identity (Ashton et al., 2003). Under the clean surplus identity there can, by definition, be no dirty surplus adjustments and so, the recursion value of equity will be based on only the first two terms of the expression contained in the above proposition. That is, when the clean surplus identity holds, the expected present value of the stream of dirty surplus adjustments,

$$E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right],$$

will be identically equal to zero. The omission of this variable, however, has some important impli-

cations for the valuation of a firm's equity and so, we now develop them in further detail.

Probably the most important implication stems from the fact that firms are seldom constrained to use their existing resources in an immutable way; that is, firms normally have the flexibility to change their existing investment opportunity set by employing 'liquidations, sell-offs, spin-offs, divestitures, CEO changes, mergers, takeovers, bankruptcies, restructurings, and new capital investments' As previously noted, the potential to make changes like these gives rise to what is known as the real (adaptation) value of equity (Burgstahler and Dichev, 1997:188). However, while it is usually a relatively simple matter to determine an analytical expression for the recursion value of a firm's equity, determining its real (adaptation) value has traditionally been a far more troublesome exercise. Fortunately, Ashton et al. (2003) show that under reasonable assumptions and a continuous time generalisation of the system of stochastic difference equations on which most models in this area are based, the real (adaptation) value of equity may be written as a product of two terms, one of which is the recursion value, $\eta(t)$, whilst the other is a variable factor itself dependent on $\eta(t)$. Furthermore, they obtain closed form expressions for both the recursion value of equity and the variable factor. They note that once the recursion value and the variable factor are known, then computing the real (adaptation) value of equity is a relatively simple exercise and they illustrate the procedures involved by determining the real (adaptation) value of equity for both the Ohlson (1995) and a more realistic 'square root', linear information dynamics interpretation of their general model.

A principal limitation of the Ashton et al. (2003) analysis, however, is that it assumes no dividends are paid and that the firm's accounting procedures will satisfy the clean surplus identity. We now develop a series of theorems that generalise the Ashton et al. (2003) Aggregation Theorem in the sense that they accommodate dividend payments and also, remove the requirement for the accounting system to satisfy the clean surplus identity. Before doing so, however, we state the first of four crucial assumptions on which our analysis is based:

⁶ Ashton et al. (2003: 417–419) impose the assumption that $0 \leq \delta \leq \frac{1}{2}$ in order to ensure that the (real) adaptation value of equity converges. However, if there are no adaptation options available to the firm this assumption may be removed and more general stochastic processes can be used to model the evolution of equity value.

⁷ The Appendix demonstrates how these 'normalising' constants may be computed.

Assumption #1

The abnormal earnings, $a(t)$, the dirty surplus adjustment, $\epsilon(t)$, as well as an 'information variable', $v(t)$, evolve in accordance with the following vector system of stochastic differential equations (continuous time Markov process):

$$dy(t) = Cy(t)dt + \eta^\delta(t)dz(t)$$

where $0 \leq \delta \leq \frac{1}{2}$ is a parameter⁶,

$$y(t) = \begin{pmatrix} a(t) \\ v(t) \\ \epsilon(t) \end{pmatrix} \text{ and } dy(t) = \begin{pmatrix} da(t) \\ dv(t) \\ d\epsilon(t) \end{pmatrix}$$

are vectors containing the levels and instantaneous changes of these variables, and

$$C = \{c_{ij}\} = \begin{pmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{pmatrix}$$

is the matrix of 'structural coefficients'. The vector of stochastic terms,

$$dz(t) = \begin{pmatrix} k_1 dz_1(t) \\ k_2 dz_2(t) \\ k_3 dz_3(t) \end{pmatrix}$$

is composed of the Wiener processes, $dz_j(t)$, and 'normalising' constants, k_j .⁷ The Wiener processes have variance parameters σ_1^2 , σ_2^2 and σ_3^2 and correlation parameters, ρ_{12} , ρ_{13} and ρ_{23} , respectively.

There are several points about this first assumption that require an airing. Uppermost amongst these is that it implies the abnormal earnings variable evolves in terms of the following process:

$$\begin{aligned} da(t) &= (c_{11}a(t) + c_{12}v(t) + c_{13}\epsilon(t))dt \\ &\quad + k_1\eta^\delta(t)dz_1(t) \end{aligned}$$

This means that instantaneous changes in the abnormal earnings attributable to equity will be normally distributed with a mean (per unit time) of

$$\frac{E_t[da(t)]}{dt} = c_{11}a(t) + c_{12}v(t) + c_{13}\epsilon(t)$$

and a variance (per unit time) of

$$\frac{\text{Var}_t[da(t)]}{dt} = k_1^2 \sigma_1^2 \eta^{2\delta}(t),$$

where $\text{Var}_t(\cdot)$ is the variance operator, taken at time t . This stochastic process can be restated in the alternative form:

$$da(t) = -c_{11} \left[\frac{-c_{12}v(t) - c_{13}\epsilon(t)}{c_{11}} - a(t) \right] dt + k_1\eta^\delta(t)dz_1(t)$$

Thus, the system of stochastic differential equations employed here implies that apart from a sto-

chastic component, the firm's current abnormal earnings, $a(t)$, will gravitate towards a long run mean of

$$\frac{-c_{12}v(t) - c_{13}\epsilon(t)}{c_{11}}$$

The force with which it will do so is proportional to the difference between this long run mean and the current instantaneous abnormal earnings, $a(t)$, where the constant of proportionality, or speed of adjustment coefficient, is given by $c_{11} < 0$.

The long run mean of the abnormal earnings variable can be thought of as a weighted average of the current information variable, $v(t)$, and the dirty surplus variable, $\epsilon(t)$. The weights applied to these variables to determine the long run mean are $\frac{-c_{12}}{c_{11}}$ and $\frac{-c_{13}}{c_{11}}$, respectively. Furthermore, whilst we might normally expect the first of these weights, $\frac{-c_{12}}{c_{11}}$, to be positive, reflecting the fact that favourable information will normally imply larger abnormal profits in future, there are conflicting forces determining the sign of the weight associated with the dirty surplus variable. Intuition suggests that positive dirty surplus adjustments would normally have favourable implications for future profitability, in which case $\frac{-c_{13}}{c_{11}}$ ought to be positive. However, this argument ignores a myriad of other factors, such as the potential political and regulatory costs associated with a continuing history of 'excess' abnormal profits and the fact that excessive profits will normally dissipate under the influence of competitive pressures. These factors suggest that management will have incentives to use whatever flexibility is available in accounting standards to conceal the magnitude of current and future abnormal earnings. This points to the possibility of a negative value for $\frac{-c_{13}}{c_{11}}$.⁸ The sum result

of these considerations is that it is probably reasonable to assume c_{12} is positive, thereby implying that the weight associated with the information variable, $\frac{-c_{12}}{c_{11}}$, will also be positive. It is less clear, however, what sign the coefficient c_{13} will take, in which case it follows that the weight, $\frac{-c_{13}}{c_{11}}$, associated with the dirty surplus variable could either be positive or negative.

Assumption #1 also implies that apart from a stochastic component, the information variable gravitates towards a long run mean of

$$\frac{-c_{21}a(t) - c_{23}\epsilon(t)}{c_{22}}$$

with a speed of adjustment coefficient equal to $c_{22} < 0$. Here, Myers (1999:11) argues that $v(t)$ provides 'a structure for adding non-accounting information into the analysis.' As such, $v(t)$ captures 'information that will affect future residual income, either directly or indirectly ... [such as] new patents, regulatory approval of a new drug for pharmaceutical companies, new long lived contracts and order backlog.' It thus follows that $v(t)$ is prospective in nature and that because of this, neither $a(t)$ nor $\epsilon(t)$, both of which are generally retrospective in nature, can adequately reflect or capture movements in the long term mean of the information variable, $v(t)$. These arguments suggest that both c_{21} and c_{23} will be (close to) zero.

Finally, we have the stochastic process for the dirty surplus variable, $\epsilon(t)$. Here Assumption #1 implies that the dirty surplus variable gravitates towards a long run mean of

$$\frac{-c_{31}a(t) - c_{32}v(t)}{c_{33}}$$

with a speed of adjustment coefficient given by $c_{33} < 0$. Now, we have previously noted that potential political, regulatory and competitive factors will mean that managers have incentives to adopt accounting policies which reduce abnormal earnings. This suggests that the weight associated with the abnormal earnings variable, $\frac{-c_{31}}{c_{33}}$, will be positive since managers can use the dirty surplus variable to reduce the firm's (headline) abnormal earnings. Furthermore, since favourable information, $v(t)$, will normally have positive implications for future profitability (and therefore the manipulation of profits through the dirty surplus variable), it appears reasonable to assume that the weight associated with the information variable, $\frac{-c_{32}}{c_{33}}$, is also likely to be positive. This will mean that both the structural coefficients, c_{31} and c_{32} , are likely to be positive.⁹

The importance of our discussion of the signs of the structural coefficients stems from the following result:

⁸ Here we should note that the 'self correcting' property of the double entry bookkeeping system places limits on the extent to which management can manipulate a firm's (abnormal) earnings. Whilst this might mean the coefficient $\frac{-c_{12}}{c_{11}}$ will be relatively 'small' there are nonetheless numerous examples in the literature of how firms do manipulate their earnings measures in ways that are consistent with the linear information dynamics assumed here. Watts and Zimmerman (1986: 208–209) note, for example, that 'estimating the future costs of restoring land after strip mining involves sufficient uncertainty to give management substantial latitude in determining the cost to be charged off in any given year [Likewise], if a firm has a loss, managers increase the loss by including all possible future losses that they can write off – take a 'big bath' – so that future periods' earnings are higher' Other provisions and accruals, such as those for future maintenance expenditures, doubtful debts etc. can also be manipulated within broad limits under existing accounting standards, especially in an environment where dirty surplus accounting is permitted. Given this, it is not hard to envisage how firms can find the 'flexibility' they need to implement linear information dynamics of the kind assumed here. Penman (2003) contains further examples of the manipulations that can be applied to the profit and loss statement.

Lemma

(i) Assumption #1 and Theorem #1 between them imply that the recursion value of equity will be:

$$\begin{aligned}\eta(t) = b(t) + & \frac{[(i - c_{22})(i - c_{33} + c_{31}) + c_{32}(c_{21} - c_{23})]a(t)}{\Delta} + \\ & \frac{[c_{12}(i - c_{33} + c_{31}) + c_{32}(i - c_{11} + c_{13})]v(t)}{\Delta} + \\ & \frac{[(i - c_{22})(i - c_{11} + c_{13}) + c_{12}(c_{23} - c_{21})]e(t)}{\Delta}\end{aligned}$$

where $\Delta = \det(iI - C)$ is the determinant of the matrix $(iI - C)$ and I is the 3x3 identity matrix.

(ii) Furthermore, the recursion value of equity will evolve in terms of the following stochastic differential equation (continuous time Markov process):

$$d\eta(t) = i\eta(t)dt - dD(t) + \eta^\delta(t)dq(t)$$

where $dq(t) = (dz_1(t) + dz_2(t)) + dz_3(t)$ is a Wiener process with variance parameter $\zeta = \sigma_1^2 + \sigma_2^2 + \sigma_3^2 + 2\rho_{12}\sigma_1\sigma_2 + 2\rho_{13}\sigma_1\sigma_3 + 2\rho_{23}\sigma_2\sigma_3$.

Proof: See Appendix.

This result also shows that the recursion value of equity is a linear sum of the book value of equity, the instantaneous abnormal earnings, the instantaneous information variable and the instantaneous dirty surplus adjustment. However, the weights, or valuation coefficients hinge on the precise form of the system of stochastic differential equations that underscore the evolution of each of these vari-

⁹ Letting sign(.) signify the signs of the coefficients of the affected matrix means that we can summarise our discussion of the probable signs of the structural coefficients in the following terms:

$$\text{sign} \begin{pmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{pmatrix} = \begin{pmatrix} - & + & ? \\ 0 & - & 0 \\ + & + & - \end{pmatrix}$$

The eigenvalues for the matrix with these structural coefficients will thus be $\lambda = c_{22} < 0$ and:

$$\lambda = \frac{(c_{11} + c_{33}) \pm \sqrt{(c_{11} - c_{33})^2 + 4c_{13}c_{31}}}{2}$$

Now, all three eigenvalues will be negative if $c_{13}c_{31} < c_{11}c_{33}$. This condition is satisfied if the matrix is diagonally dominant, or under the slightly weaker conditions $|c_{11}| > |c_{13}|$ and $|c_{33}| > |c_{31}|$. Intuitively, such conditions imply that the main factor influencing changes to a variable are its value in the previous period with the values of the other variables in the previous period playing a relatively minor role. Under such a scenario, we can expect that $a(t)$, $v(t)$ and $e(t)$ will asymptotically converge towards zero. If, however, $c_{13}c_{31} > c_{11}c_{33}$ then one of the eigenvalues will be positive and $a(t)$, $v(t)$ and $e(t)$ may exhibit explosive properties. A much more detailed consideration of this issue is to be found in O'Neil (1987: 373–386), Ashton (1997) and Tippett and Warnock (1997: 1076–1084).

ables. The prior work of Ohlson (1995) and others has shown that book value, abnormal earnings and the information variable are all likely to have an instrumental role to play in the determination of equity value. The potential impact of the dirty surplus variable, however, hinges on both the signs and the interrelationships between the structural coefficients comprising its valuation coefficient. Here, we have previously observed that the structural coefficients c_{21} and c_{23} are both likely to be (near) zero and so, this means that the sign and magnitude of c_{13} will determine whether the dirty surplus variable has a role to play in the valuation of equity. Previous analysis suggests that c_{13} could be either positive or negative. A positive value for c_{13} means that the dirty surplus variable will have a significant role to play in the valuation of equity; if, however, c_{13} ($\approx c_{11} - i$) is sufficiently negative, then the dirty surplus variable will have little or no role to play in equity valuation.¹⁰

A second feature of the above result is that it shows the instantaneous growth rate in the recursion value of equity to evolve in terms of a process whose mean and variance (per unit time) are

$$\frac{1}{\eta(t)} \frac{E_t[d\eta(t)]}{dt} = i - \frac{1}{\eta(t)} \frac{dD(t)}{dt} \text{ and } \frac{\text{Var}_t[\frac{d\eta(t)}{\eta(t)}]}{dt} = \frac{\zeta}{\eta^{2(1-\delta)}(t)},$$

¹⁰ We can further demonstrate the importance of this issue by assuming that the structural coefficients c_{31} and c_{32} are both zero in which case the dirty surplus variable evolves in terms of the parsimonious process:

$$de(t) = c_{33}e(t)dt + k_3\eta^\delta(t)dz_3(t)$$

This process implies that the dirty surplus adjustment has an unconditional mean of zero, independent of the current magnitudes of the abnormal earnings and information variables. Whilst it is unlikely that such a simple model could apply in practice, it does provide a useful benchmark through which to compare models based on abnormal earnings and the information variable alone, with models that also incorporate a dirty surplus adjustment. Now, if we follow the text in assuming that both c_{21} and c_{23} are also zero, then we can substitute into the above Lemma to show that the recursion value of equity will be:

$$\eta(t) = b(t) + \frac{a(t)}{(i - c_{11})} + \frac{c_{12}v(t)}{(i - c_{11})(i - c_{22})} + \frac{(i - c_{11} + c_{13})e(t)}{(i - c_{11})(i - c_{33})}$$

Now, the coefficients associated with the abnormal earnings, $a(t)$, and information variables, $v(t)$, in this formula are the same as those obtained for the more restricted linear information dynamics based on the clean surplus identity assumed in the Ashton et al. (2003: 420–425) paper. Thus, if this parsimonious interpretation of dirty surplus accounting applies in practice, it follows that the last term in this formula will be the valuation bias in the recursion value of equity as a result of falsely assuming the validity of the clean surplus identity. At an empirical level, this will translate into an omitted variables problem. This will mean that regression models that ignore the dirty surplus component of changes in book value will be both inconsistent and inefficient (Greene, 1997: 402–404).

respectively. This means that on average, instantaneous increments in the recursion value of equity (gross of any dividends paid) will be just sufficient to yield a return (on recursion value) equal to the cost of the firm's equity capital, i . Here it is also worth emphasising that since the convergence criteria outlined in Ashton et al. (2003:417–419) require $\delta \leq \frac{1}{2}$, the uncertainty surrounding the rate at which the recursion value of equity grows, as measured by its variance, declines as the recursion value becomes larger. This provides a potential explanation of, and certainly a basis for future research into, firm size as the significant explanatory variable in empirical research that it has proved to be (Fama and French, 1992, 1995). Furthermore, since Ashton et al. (2003:417–419) show that the overall market value of equity is parameterised in terms of its recursion value, it necessarily follows that any biases in recursion value will also be reflected as biases in the estimated market value of equity itself. This is an issue that we now explore in further detail.

3. Equity valuation, dividends and dirty surplus accounting

The previous section develops and analyses some important results relating to the recursion value of equity when there is dirty surplus accounting and the firm pays dividends. We now develop some related results for the real (adaptation) value of equity and by implication, the overall market value of equity. Our analysis is based on the standard ‘no arbitrage’ conditions that characterise this area of the literature and which may be summarised in the following terms:

Assumption #2

The market value of the firm's equity, $P(\eta(t))$, satisfies the ‘no arbitrage’ condition:

$$P(\eta(t)) = dD(t) + e^{-idt}E_t[P(\eta(t+dt))]$$

where, as previously, $E_t(\cdot)$ is the expectations operator taken at time t .¹¹

This second assumption requires that the market value of equity ‘today’ must be equal to the sum of the instantaneous dividend payment ‘today’ and the expected discounted market value of equity ‘tomorrow’. This means that equity will be priced so that only ‘normal’ returns can be expected; that is, its expected return is equal to the cost of capital, i . More important, however, is that no arbitrage may be combined with our earlier assumption (#1) about the evolution of the determining variables to derive a fundamental differential equation that the market value of equity will have to satisfy:

Theorem #2

Assumptions 1 → 2 imply that the market value of equity will satisfy the differential equation:

$$\frac{1}{2}\zeta\eta^2\frac{d^2P}{d\eta^2} + (i\eta - \frac{dD}{dt})\frac{dP}{d\eta} + (\frac{dD}{dt} - iP(\eta)) = 0$$

where η is the recursion value of equity as defined in part (i) of the above Lemma and $\zeta = \sigma_1^2 + \sigma_2^2 + \sigma_3^2 + 2\rho_{12}\sigma_1\sigma_2 + 2\rho_{13}\sigma_1\sigma_3 + 2\rho_{23}\sigma_2\sigma_3$ is the variance parameter associated with instantaneous changes in the recursion value of equity.

Proof: See Appendix.

It is important to note that direct substitution shows $P(\eta) = \eta$ to be a solution of the above differential equation and this will be so irrespective of the particular form of the dividend function, $D(t)$. This means, of course, that the recursion value of equity, η , does not depend on the dividend policy invoked by the firm. Here, it will be recalled that the Miller and Modigliani (1961) theorem says that if, in a perfect capital market without taxation a firm's existing investment opportunity set (or equivalently, its linear information dynamics) is applied indefinitely into the future, then ‘the division’ of a firm's earnings ‘between cash dividends and retained earnings in any period is a mere detail’ In particular, ‘the dividend payout ... determine[s] merely how a given return to stockholders ... split[s] as between current dividends and current capital gains and [does] not affect either the size of the total return or the current value of the shares.’ (Graham et al., 1962:487–488.) Hence, the fact that $P(\eta) = \eta$ is a solution of the fundamental differential equation irrespective of what particular form the dividend function, $D(t)$, might take is merely a reflection of the Miller and Modigliani (1961) dividend ‘irrelevance’ theorem. Here, however, it is unfortunate that there is now overwhelming evidence that a firm's dividend policy can have a significant impact on the market value of its equity (Black, 1976; Miller, 1986; Soter, 2001; Akbar and Stark, 2003).

While a variety of explanations have been offered for this, a seldom invoked reason stems from

¹¹ An alternative and more complicated statement of the arbitrage condition formulated here involves working directly in terms of the underlying state variables, $b(t)$, $a(t)$, $v(t)$ and $\varepsilon(t)$. The arbitrage condition would then take the form:

$$P(b(t), a(t), v(t), \varepsilon(t)) = dD(t) + e^{-idt}E_t[P(b(t+dt), a(t+dt), v(t+dt), \varepsilon(t+dt))]$$

It is easily shown, however, that the recursion value of equity, $\eta(t)$, is a ‘sufficient statistic’ in the sense that all subsequent results stated in this paper can be obtained using either the more complicated statement of the arbitrage condition formulated above or its simpler ‘canonical’ equivalent stated in the text.

the fact that dividend payments will in general increase the probability that the firm will have to exercise its real (adaptation) options, thereby increasing the value of these options to the firm. The main difficulty with demonstrating the importance of this point is that there are few functional forms for the dividend function that lead to tractable expressions for the market value of equity. Given this, we adopt one of the few functional forms that does lead to tractable expressions for the market value of equity; namely, 'proportional' dividends as captured by the following assumption (Merton, 1973:171):

Assumption #3

The instantaneous dividend payment is strictly proportional to the recursion value of equity, or:

$$dD(t) = \alpha\eta(t)dt$$

where $0 \leq \alpha < i$ is the constant of proportionality.

Our final assumption relates to the timing and magnitude of the benefits (and costs) that arise when the firm exercises the real (adaptation) options available to it. Again, tractability is an important consideration, although there are some obvious limitations on the extent to which we can simplify matters. When, for example, the stream of future dividends is relatively 'small' the firm will more than likely seek to redeploy its resources in alternative and more productive ways. Against this, if the expected present value of future dividends is relatively 'large' then the firm will have little or no incentive to change the existing (and highly profitable) ways in which it conducts its operations (Burgstahler and Dichev, 1997:193). These considerations lead to the requirement that the firm's operations are to conform with the following (analytically convenient) boundary conditions:

Assumption #4

(i) If the expected present value of the stream of future dividends declines to zero; that is, if:

$$\eta(t) = E_t \left[\int_t^\infty e^{-i(s-t)} dD(s) \right] = 0$$

then the firm will invest in a capital project with a known market value (net of acquisition costs) of $P(0)$. That is:

$$\lim P(\eta) = P(0) > 0.$$

$$\eta \rightarrow 0$$

(ii) As the expected present value of the stream of future dividends becomes progressively larger; that is, as:

$$\eta(t) = E_t \left[\int_t^\infty e^{-i(s-t)} dD(s) \right] \rightarrow \infty$$

then market value of equity, $P(\eta)$, converges asymptotically towards η . That is:

$$\lim_{\eta \rightarrow \infty} P(\eta) = \eta.$$

The non-zero value we assume for $P(0)$ in part (i) of this assumption implies that the firm in effect exercises an option to change its investment opportunity set when the prospective dividend stream from its existing portfolio of capital projects has all but dried up. Given this, we follow Yee (2000) in defining $P(0)$ as the 'dormant value' of equity. Furthermore, this assumption also implies that when the recursion value is 'small' ($\eta \rightarrow 0$), then equity value is composed mainly of its real (adaptation) value. Likewise, when recursion value is 'large' ($\eta \rightarrow \infty$), then equity value is principally composed of its recursion value. When, however, the recursion value is neither small nor large then for the 'square root' process ($\delta = \frac{1}{2}$) introduced by Ashton et al. (2003) the market value of equity will evolve in accordance with the valuation formula given in the following theorem:

Theorem #3

Assumptions 1 → 4 imply that all non-singular solutions of the differential equation:

$$\frac{1}{2}\zeta\eta \cdot \frac{d^2P}{d\eta^2} + (i\eta - \frac{dD}{dt}) \cdot \frac{dP}{d\eta} + (\frac{dD}{dt} - iP(\eta)) = 0$$

will be of the form:

$$P(\eta) = \eta + P(0) \int_{\eta}^{\infty} \exp\left[\frac{2(\alpha-i)y}{\zeta}\right] \frac{P_1(y)}{P_1^2(y)} dy$$

where:

$$P_1(\eta) = \eta + \frac{\alpha}{\zeta} \eta^2 + \frac{\alpha(2\alpha-i)}{3\zeta^2} \eta^3 + \frac{\alpha(2\alpha-i)(3\alpha-2i)}{18\zeta^3} \eta^4 + \dots$$

Proof: See Appendix.

This result shows the market value of equity is potentially, a highly non-linear function of its determining variables. This is of particular significance given the penchant amongst empirical researchers for applying purely linear methodologies to estimate the valuation relationships that exist in this area (Burgstahler and Dichev, 1997:193). It is not hard to show, however, that if, as the empirical evidence seems to suggest, there is a non-linear relationship between equity prices and their determining variables (Lev, 1989; Burgstahler and Dichev, 1997:199; Ashton et al., 2003:429), then the purely linear methodologies that characterise empirical research in this area will be an unreliable

basis for estimating the relevant valuation relationships.¹²

There is, however, a second issue that emerges out of the non-linear pricing relationships that our analysis suggests ought to exist in this area. And this relates to the role that dividends play in the valuation of equity. We have previously observed how the Miller and Modigliani (1961) theorem means that the dividend function, $D(t)$, cannot enter into the (functional) expression for the recursion value of equity. However, the real (adaptation) value of equity depends on the potential changes a firm can make to its existing investment opportunity set and, consistent with the real options literature (Dixit and Pindyck, 1994:154), our analysis shows that the dividend function, $D(t)$, can enter into the (functional) expression for this component of equity value. Dividend payments reduce the resources available to the firm and thereby adversely affect its capacity to 'ride out' unfavourable economic circumstances. This in turn increases the probability that the firm will have to exercise its real (adaptation) options and so, these options become more valuable as a consequence.

We can demonstrate the importance of the point we are making here by comparing the way equity value evolves as a function of its recursion value for a dividend paying and a non-dividend paying firm. We begin by considering a firm with a 'dormant value' of $P(0) = 1$ and whose dividend payout rate (as a proportion of its recursion value) is equal to one half the cost of its equity capital. This means the dividend payout rate will be $\alpha = \frac{i}{2}$ and so from Theorem #3, the overall market value of the firm's equity will have to be:

$$P(\eta) = \eta + (\eta + \frac{i}{2\zeta} \cdot \eta^2) \int_{\eta}^{\infty} \frac{\exp(-\frac{i}{\zeta}y)}{(y + \frac{i}{2\zeta} \cdot y^2)^2} dy$$

¹² Freeman (1963: 50) provides a simple example that demonstrates the importance of the point being made here. Consider a standardised variable, x , which is symmetric about its mean. Let x and y be functionally related according to the formula $y = x^2$. Now, the covariance between x and y will be $E[(x - E(x))(y - E(y))] = E(x^3 - x) = 0$ and so, a naive interpretation of the linear regression of y on x is that these two variables are completely unrelated. Admittedly this is a simple example concocted to provide a parsimonious illustration of the point at issue. However, it is not hard to construct more realistic (but less parsimonious) examples of linear methodologies that are unable to detect (or alternatively, distort) the complicated non-linear relationships that appear to exist in this area. Miller (1986: S461) and Holthausen and Watts (2001: 52–63) contain useful discussions and extensions of some of the issues raised here.

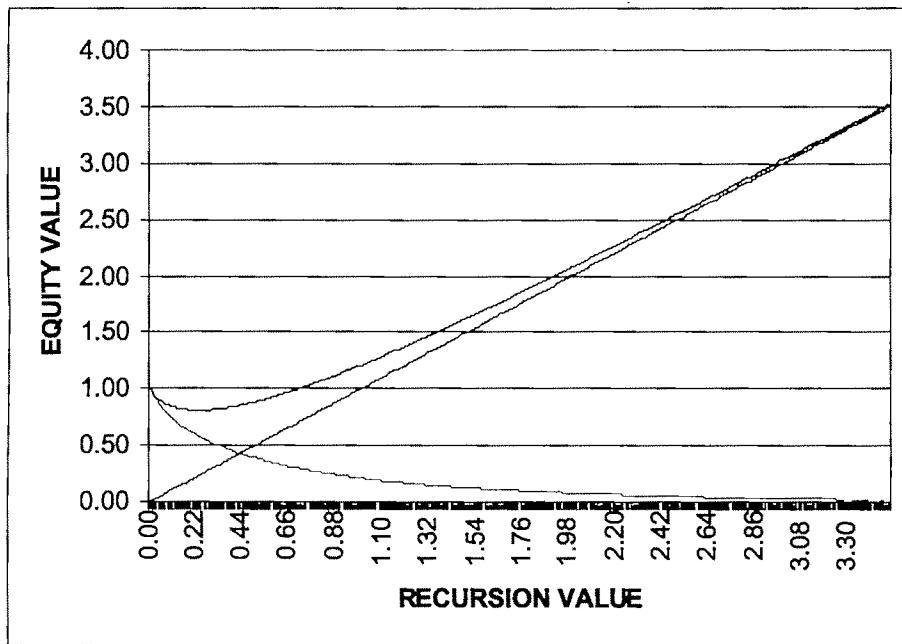
In Figure 1 we plot the above pricing relationship when the parameter $\frac{i}{\zeta} = \frac{2\alpha}{r}$ assumes the values 0.50, 1.00 and 1.50. Note that as $\frac{i}{\zeta}$ becomes larger, these graphs show that the real (adaptation) value of equity decays quickly away. Thus, when $\frac{i}{\zeta} = 0.50$ (or equivalently, $\frac{\alpha}{r} = 0.25$) and the recursion value of equity is $\eta = 1$ then the real (adaptation) value of equity will be 0.2101. When, however, $\frac{i}{\zeta} = 1.00$ (so that $\frac{\alpha}{r} = 0.50$) and the recursion value of equity is $\eta = 1$ then the real (adaptation) value of equity falls to 0.0987. Finally, when $\frac{i}{\zeta} = 1.50$ (or $\frac{\alpha}{r} = 0.75$) and the recursion value of equity is $\eta = 1$ then the real (adaptation) value of equity falls again to 0.0563. This continuous fall in the real (adaptation) value of equity occurs because as $\frac{i}{\zeta}$ grows, the uncertainty associated with the evolution of the recursion value of equity, declines. If, for example, the variance parameter, $\zeta = \sigma_1^2 + \sigma_2^2 + \sigma_3^2 + 2\rho_{12}\rho_1\rho_2 + 2\rho_{13}\rho_1\rho_3 + 2\rho_{23}\rho_2\rho_3$, is very close to zero then there is virtually no uncertainty associated with the evolution of the recursion value of equity. This will also mean that $\frac{i}{\zeta}$ will have a relatively large value. If, however, there is a great deal of uncertainty about the evolution of the recursion value of equity then ζ will be large relative to i and this means that $\frac{i}{\zeta}$ will have a relatively small value. Now, it is well known that option value is an increasing function of the volatility of its determining variables. This in turn will mean that when $\frac{i}{\zeta}$ has a relatively low value (or equivalently, when the volatility, ζ , has a relatively large value) the real (adaptation) value of equity will have to be relatively large. When, however, $\frac{i}{\zeta}$ assumes a relatively large value (so that the volatility, ζ , has a comparatively small value) then the real (adaptation) value of equity will have to be relatively small.

There is one further characteristic of the graphs appearing in Figure 1 that requires an airing. Note that as the parameter $\frac{i}{\zeta}$ becomes larger, a 'smirk' (or minimum) gradually appears in the overall value of equity when the recursion value of equity is 'small'. This smirk arises out of the fact that for small recursion values the decline in the real (adaptation) value of equity is much larger than is the increase in the recursion value itself. As a consequence, as $\frac{i}{\zeta}$ becomes larger there is an increasingly large domain over which the aggregate sum of the real (adaptation) and recursion values of equity and hence, the overall market value of equity, will decline. Interestingly, both Burgstahler (1998:338–339) and Ashton et al. (2003:428–430) find evidence for the existence of such a smirk in the samples of publicly listed companies on which their empirical analysis is based.

In contrast to the dividend paying firm considered in previous paragraphs, suppose now, we consider a non-dividend paying firm which also has a dormant value of $P(0) = 1$. Then Ashton et al.

Figure 1

Equity value for a firm that pays an instantaneous proportionate dividend equal to $\alpha = \frac{1}{2} = 0.25\zeta$ of its recursion value



Equity value for a firm that pays an instantaneous proportionate dividend equal to $\alpha = \frac{1}{2} = 0.50\zeta$ of its recursion value

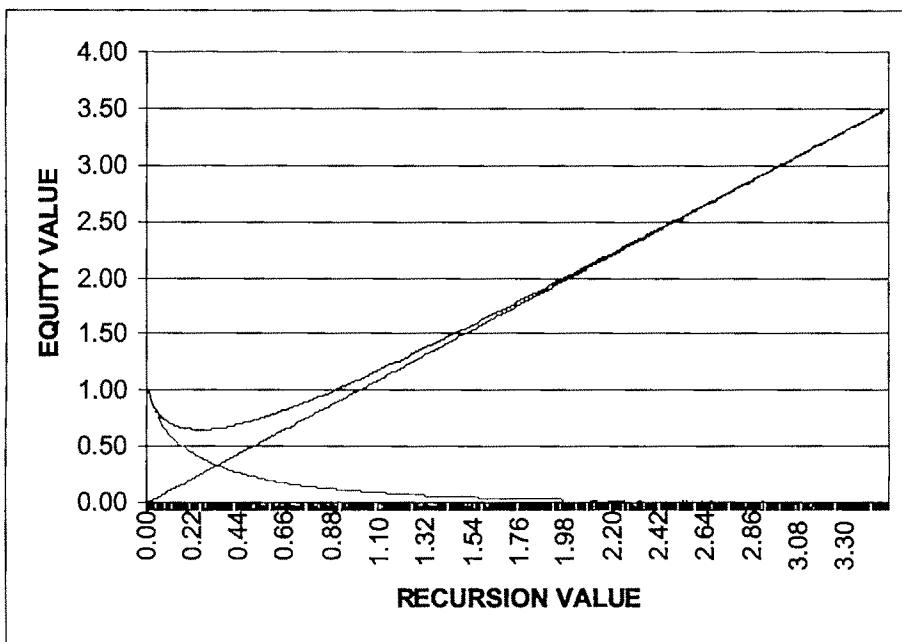
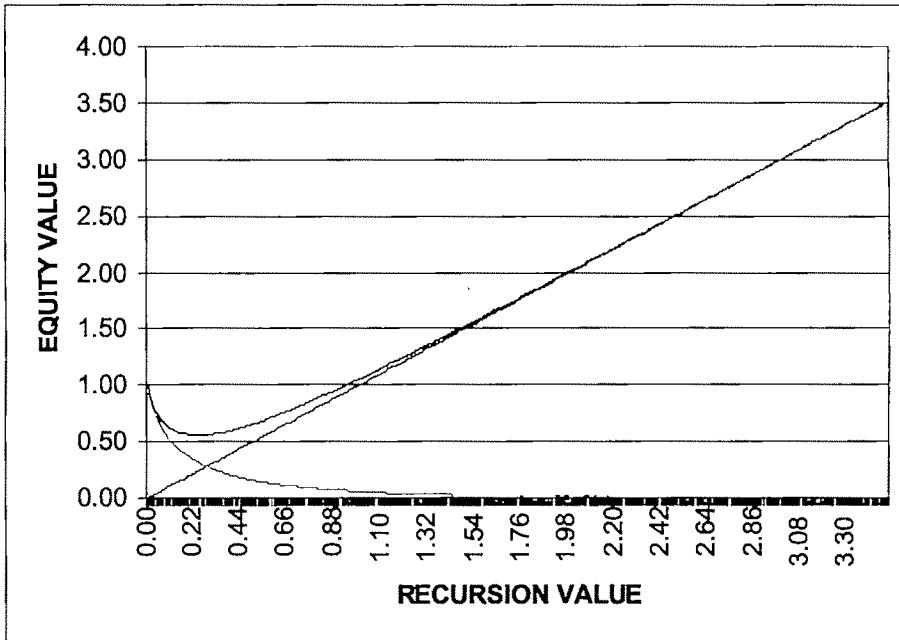


Figure 1 (continued)

Equity value for a firm that pays an instantaneous proportionate dividend equal to $\alpha = \frac{1}{2} = 0.75\zeta$ of its recursion value



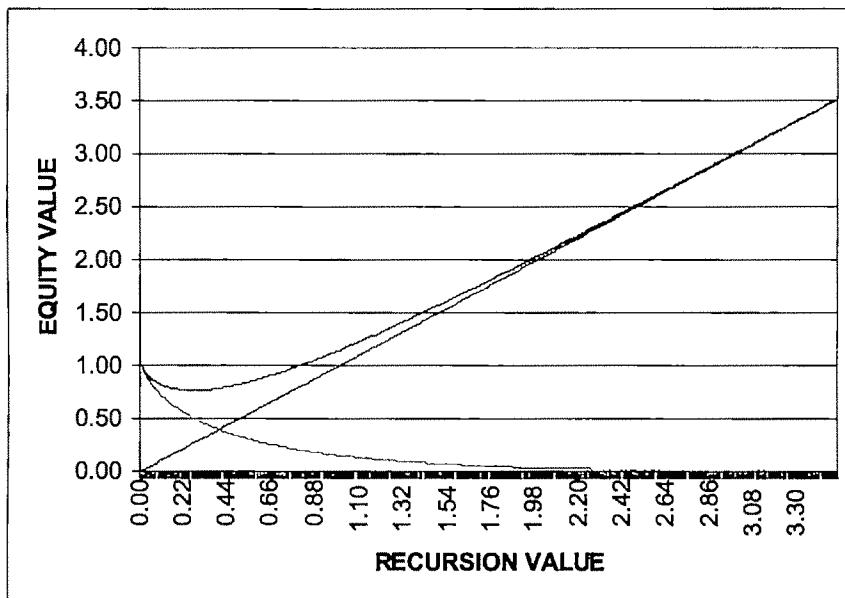
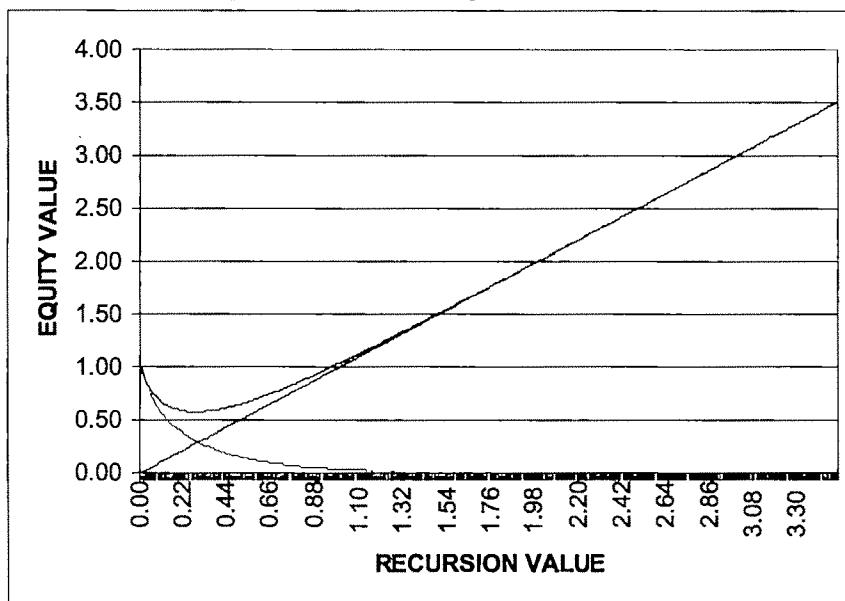
The downward sloping curve in each of the above graphs is the real (adaptation) value of equity; namely:

$$\left(\eta + \frac{i}{2\zeta}\eta^2\right) \int_{\eta}^{\infty} \frac{\exp(-\frac{i}{\zeta}y)}{(y + \frac{i}{2\zeta}y^2)^2} dy = \frac{1}{2} \int_{-1}^{1} \frac{\exp\left[1 - \sqrt{\frac{4i(\eta + \frac{i}{2\zeta}\eta^2)}{1+z}}\right]}{\sqrt{1 + \frac{4i(\eta + \frac{i}{2\zeta}\eta^2)}{1+z}}} dz$$

The upward sloping line is the recursion value of equity, η . The upward sloping curve is the overall value of equity which is the sum of its recursion value and its real (adaptation) value, or:

$$P(\eta) = \eta + \left(\eta + \frac{i}{2\zeta}\eta^2\right) \int_{\eta}^{\infty} \frac{\exp(-\frac{i}{\zeta}y)}{(y + \frac{i}{2\zeta}y^2)^2} dy$$

The integrals in the above expressions were estimated using 15 point Gauss-Legendre quadrature (Carnahan et al., 1969:101–105).

Figure 2¹³Equity value for a non-dividend paying firm when $i = 0.50\zeta$ Equity value for a non-dividend paying firm when $i = \zeta$ 

¹³ The downward sloping curve in each of the above graphs is the real (adaptation) value of equity; namely:

which is the sum of its recursion value and its real (adaptation) value, or:

$$\eta \int_{-\infty}^{\infty} \frac{\exp(-2i\zeta y)}{y^2} dy = \frac{1}{2} \int_{-1}^1 \frac{-4i\zeta \eta}{z^2} dz$$

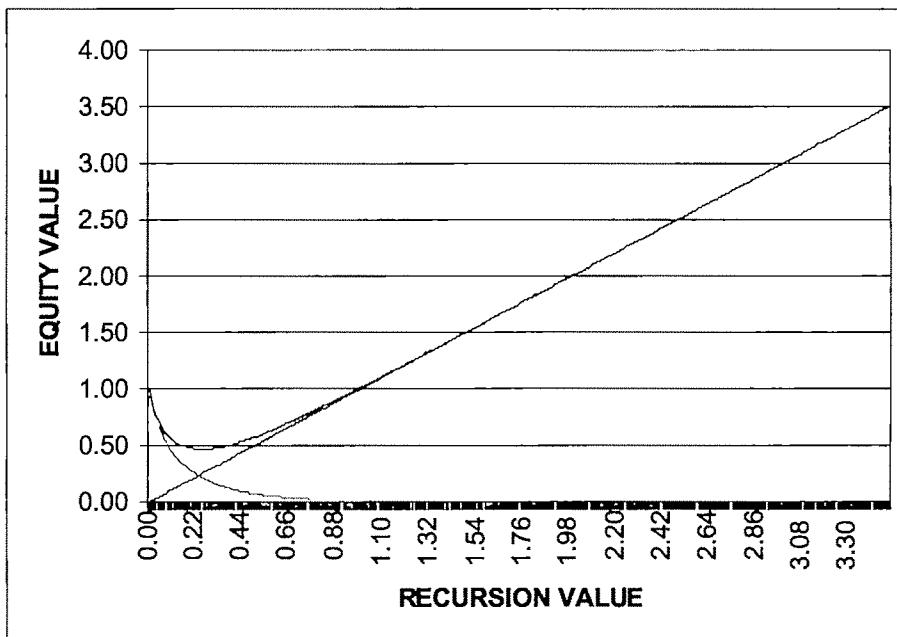
$$P(\eta) = \eta + \eta \int_{-\infty}^{\infty} \frac{\exp(-2i\zeta y)}{y^2} dy$$

The upward sloping line is the recursion value of equity, η . The upward sloping curve is the overall value of equity

The integrals in the above expressions were estimated using 15 point Gauss-Legendre quadrature (Carnahan et al., 1969: 101–105).

Figure 2 (continued)

Equity value for a non-dividend paying firm when $i = 1.5\zeta$



(2003:434) show that the market value of this non-dividend paying firm's equity will be:

$$P(\eta) = \eta + \eta \int_{\eta}^{\infty} \frac{\exp(-\frac{2i}{\zeta}y)}{y^2} dy$$

In Figure 2 we plot the above pricing relationship when the parameter $\frac{i}{\zeta}$ assumes the values 0.50, 1.00 and 1.50. Note that on the surface at least, these graphs appear to be almost identical to the graphs for the dividend-paying firm with the same parameter values. Thus, as $\frac{i}{\zeta}$ becomes larger, the real (adaptation) value of equity decays more quickly – reflecting the fact that for large values of $\frac{i}{\zeta}$ there is relatively less volatility in the evolution

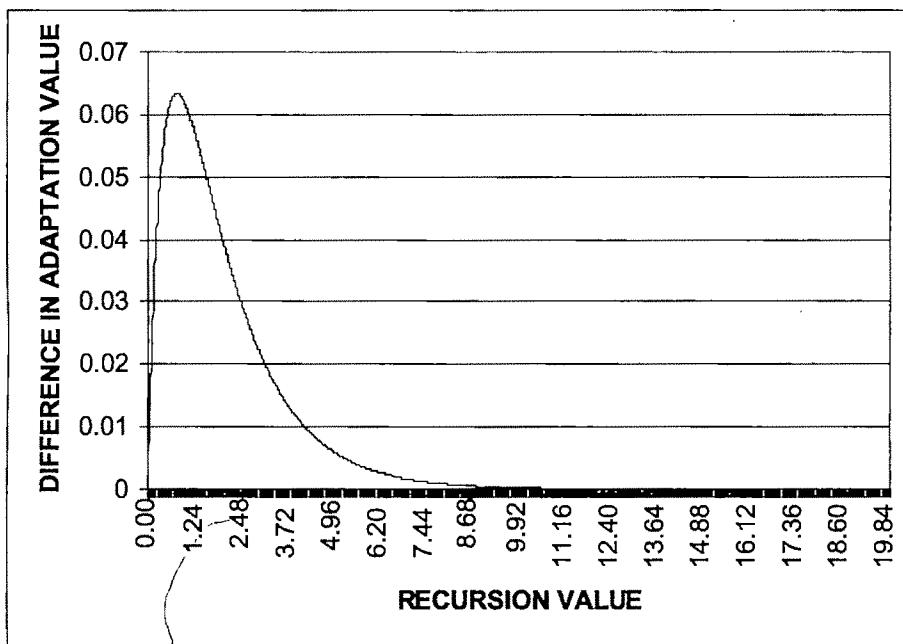
of recursion value, and option values must be lower as a consequence. Likewise, as $\frac{i}{\zeta}$ becomes larger the rate of decline in the real (adaptation) value of equity is much greater than the rate of increase in the recursion value and so once again a smirk opens up in the overall market value of the firm's equity. Yet, despite the similarities in these graphs there are, in fact, significant differences in the values of the dividend and non-dividend paying firms, something that can be confirmed from the graphs appearing in Figure 3.

This Figure graphs the difference between the equity value of a firm that pays no dividends at all and a firm whose dividend payout rate (as a proportion of its recursion value) is equal to one half the cost of its equity capital. The equity value for a dividend-paying firm is summarised in Figure 1 while the equity value for a non-dividend paying firm is summarised in Figure 2. Thus, Figure 3 summarises the differences between these two sets of graphs when the parameter $\frac{i}{\zeta}$ assumes the values 0.50, 1.00 and 1.50.¹⁴ Note that for large recursion values there is very little difference between the overall equity value of a dividend paying firm and the equity value of a non-dividend paying firm. This reflects the fact that when the recursion value of equity is large there is only a small probability the firm will have to exercise its real (adaptation) options and this will be so irre-

¹⁴ In the Appendix we tabulate the real (adaptation) value of equity for two firms, both of which have a recursion value of $\eta = £1$ and a dormant value of equity of $P(0) = £1$, for values of the ratio of the cost of equity capital to the variance parameter that vary from $\frac{i}{\zeta} = 0.3$ to $\frac{i}{\zeta} = 20$. The first of these firms does not pay dividends while the second firm pays instantaneous dividends that are proportional to the recursion value of equity. The constant of proportionality is equal to one half the cost of its equity capital. Note that the real (adaptation) value of the dividend paying firm always exceeds the real (adaptation) value of the non-dividend paying firm.

Figure 3

Difference between the real (adaptation) value of equity for a firm that pays dividends equal to $\alpha = \frac{1}{2} = 0.25\zeta$ of recursion value and a firm that does not pay dividends



Difference between the real (adaptation) value of equity for a firm that pays dividends equal to $\alpha = \frac{1}{2} = 0.50\zeta$ of recursion value and a firm that does not pay dividends

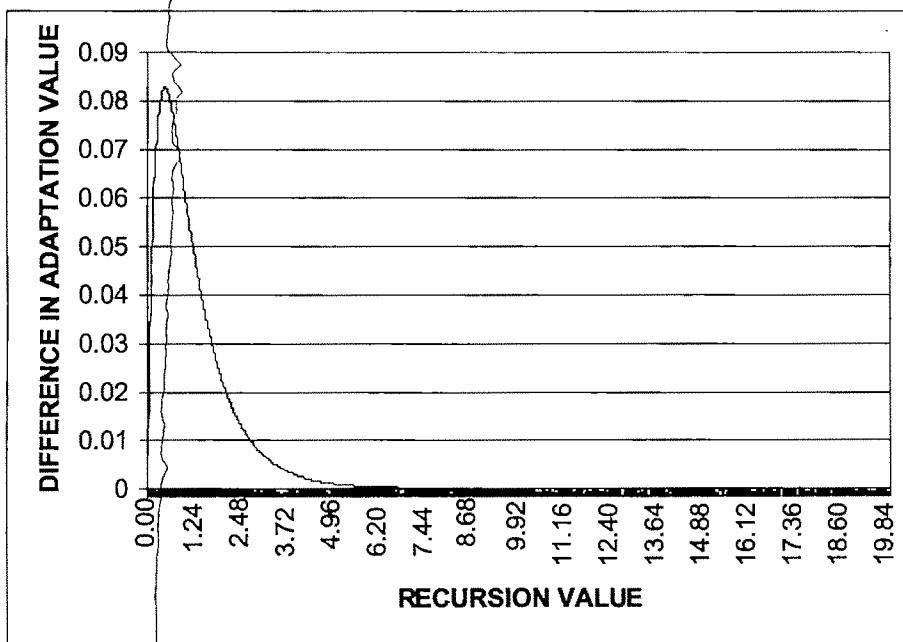
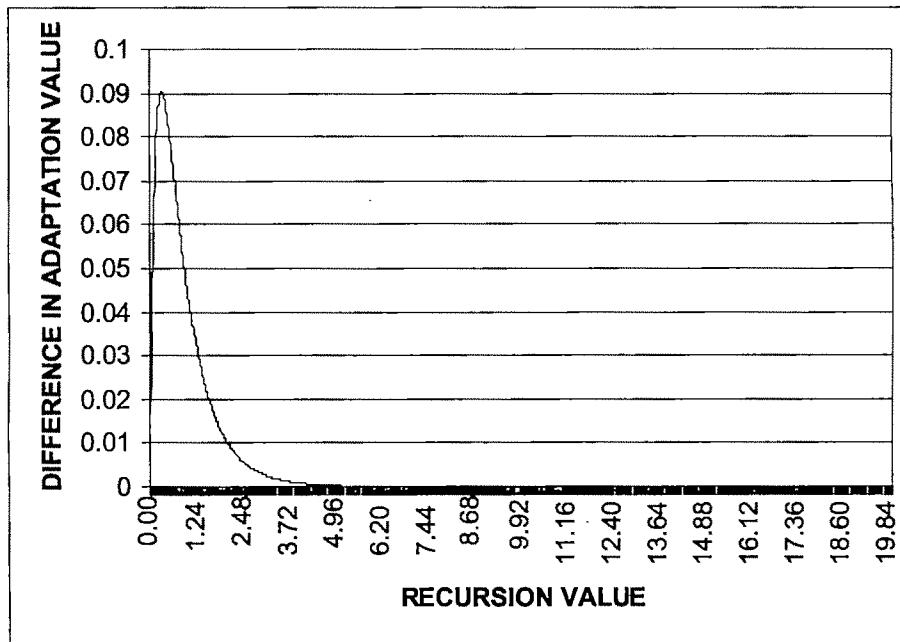


Figure 3 (continued)

Difference between the real (adaptation) value of equity for a firm that pays dividends equal to $\alpha = \frac{1}{2} = 0.75\zeta$ of recursion value and a firm that does not pay dividends



The above graphs summarise the difference between the equity value of a dividend-paying firm and the equity value of a non-dividend paying firm, or:

$$\left(\eta + \frac{i}{2\zeta} \eta^2 \right) \int_{\eta}^{\infty} \frac{\exp(-\frac{i}{\zeta}y)}{(y + \frac{i}{2\zeta} \cdot y^2)^2} dy - \eta \int_{\eta}^{\infty} \frac{\exp(-\frac{-2i}{\zeta}y)}{y^2} dy$$

The value of equity for the dividend-paying firm is graphed in Figure 1. The value of equity for the non-dividend paying firm is graphed in Figure 2. The integrals in the above expressions were estimated using 15-point Gauss-Legendre quadrature (Carnahan et al., 1969:101–105).

spective of whether the firm pays dividends or not. Hence, the value of the real (adaptation) options will be small for both the dividend and the non-dividend paying firms. For low recursion values, however, the graphs in Figure 3 show that there can be quite significant differences between the equity values of the dividend and non-dividend paying firms. When the recursion value of equity is already low, dividends will reduce recursion value even more and so, there is a significantly higher probability that a dividend-paying firm will have to exercise its real (adaptation) options when compared to a non-dividend paying

firm. This means, of course, that the real (adaptation) options will be much more valuable to the dividend paying firm and so, for a given (common) recursion value the dividend paying firm will have a higher equity value than the non-dividend paying firm. The reader will confirm that this story is born out by the graphs appearing in Figure 3. Thus, in all three graphs the difference between the equity value of a dividend paying firm and the equity value of a non-dividend paying firm moves steadily towards a maximum and then gradually decays away until there is little difference between the equity values of the two firms.

5. Summary and conclusions

Our purpose here is to respond to Burgstahler and Dichev (1997:212) and Penman's (2001:692) call for the development of more refined equity valuation models. We do so by determining an analytical expression for the value of a firm's equity under linear information dynamics that encompasses dirty surplus accounting and also, where dividends are paid by the firm. Our analysis is based on two 'dirty surplus' propositions. The first of these shows how the recursion value of equity is determined when there is dirty surplus accounting; that is, when the clean surplus identity does not hold. The second shows that the recursion value of equity will be a weighted sum of the book value of equity, abnormal earnings, the information variable and the dirty surplus adjustment. Furthermore, this proposition also shows that ignoring the dirty surplus variable will, in general, induce biases in the functional expression for the recursion value of equity.

Our analysis also shows that while the Miller and Modigliani (1961) dividend irrelevance theorem applies to the recursion value of equity, it will not, in general, apply to its real (adaptation) value. Recursion value is computed under the assumption that the firm's investment opportunity set will not change and since Miller and Modigliani (1961) show that in a perfect capital market without taxation, it is the investment opportunity set and not

dividends that determines value, it is clear that recursion value will have to be independent of the firm's dividend policy. However, real (adaptation) value is determined by the potential changes a firm can make to its existing investment opportunity set and our analysis shows that dividend payments can have an impact on this component of equity value. For parsimonious dividend payout assumptions (e.g., dividends proportional to the recursion value of equity), the 'structure' of the equity valuation problem is similar to the no-dividend case but leads to much more general valuation formulae than those contained in the Ashton et al. (2003) paper.

Our study also raises issues of some significance for future research in the area. A more sophisticated model of equity pricing based on finer disaggregations of changes in the book value of equity would enable researchers to explore the value implications of other components of a firm's financial statements (Stark, 1997; Ashton et al., 2003:419). Furthermore, since most empirical work reported in this area is predicated on the assumption of a linear relationship between equity value and the information variables, there is the important issue of the potential biases which arise when the non-linearities induced by a firm's real (adaptation) options are ignored. Finally, there is the crucial issue of how alternative dividend policies impact on the real (adaptation) value and the overall market value of a firm's equity.

Appendix

Dirty surplus accounting and the recursion value of equity

It will be recalled from the text that $D(t)$ is the function whose value is the accumulated dividends paid over the (semi-closed) time interval $[0,t]$. It then follows that $dD(t) = D(t+dt) - D(t)$ represents the instantaneous dividend payment at time t . Hence, the expected present value of the future dividend stream will be:

$$\eta(t) = E_t \left[\int_t^\infty e^{-i(s-t)} dD(s) \right]$$

where $E_t(\cdot)$ is the expectations operator taken at time t and i is the cost of capital (per unit time) applicable to equity. Now, changes in the book value of equity, $db(t)$, are related to dividends paid through the instantaneous dirty surplus identity, which is:

$$db(t) = (x(t) + \epsilon(t))dt - dD(t)$$

where $x(t)$ is the instantaneous accounting (or book) earnings (per unit time) and $\epsilon(t)$ is the instantaneous dirty surplus adjustment (per unit time), both at time t . It thus follows that the expected present value of dividends can be restated as:

$$\eta(t) = E_t \left[\int_t^\infty e^{-i(s-t)} (x(s) + \epsilon(s)) ds \right] - E_t \left[\int_t^\infty e^{-i(s-t)} db(s) \right]$$

Hence, if we impose the transversality condition:

$$\lim_{s \rightarrow \infty} e^{-i(s-t)} E_t[b(s)] = 0$$

and integrate the last term by parts, then we have:

$$\eta(t) = b(t) + E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] + E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right]$$

where $a(t) = x(t) - ib(t)$ is the instantaneous residual income (per unit time) applicable to equity. Thus, the expected present value of the future dividend stream is equivalent to the book value of equity plus the sum of the expected present value of the residual income stream and the expected present value of the dirty surplus adjustments, both at time t .

Linear information dynamics and the recursion value of equity

From Assumption #1 in the text the stochastic process for abnormal earnings is:

$$da(t) = (c_{11}a(t) + c_{12}v(t) + c_{13}\epsilon(t))dt + k_1\eta^\delta(t)dz_1(t)$$

The expected present value of the stream of abnormal earnings is:

$$E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right].$$

Integrating by parts and invoking the transversality condition:

$$\lim_{s \rightarrow \infty} e^{-i(s-t)} E_t[a(s)] = 0$$

implies:

$$(i - c_{11}) E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] = a(t) + c_{12} E_t \left[\int_t^\infty e^{-i(s-t)} v(s) ds \right] + c_{13} E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right]$$

Similar considerations show that the information variable, $v(t)$, will satisfy the following equation:

$$(i - c_{22}) E_t \left[\int_t^\infty e^{-i(s-t)} v(s) ds \right] = v(t) + c_{21} E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] + c_{23} E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right]$$

Likewise, for the dirty surplus variable we must also have:

$$(i - c_{33}) E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right] = \epsilon(t) + c_{31} E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] + c_{32} E_t \left[\int_t^\infty e^{-i(s-t)} v(s) ds \right]$$

Collecting these results into matrix form shows:

$$(iI - C)\underline{E}(t) = \underline{y}(t)$$

where I is the 3×3 identity matrix, $C = \{c_{ij}\}$ is the matrix of structural coefficients,

$$\underline{E}(t) = \begin{pmatrix} E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] \\ E_t \left[\int_t^\infty e^{-i(s-t)} v(s) ds \right] \\ E_t \left[\int_t^\infty e^{-i(s-t)} \epsilon(s) ds \right] \end{pmatrix} \text{ and } \underline{y}(t) = \begin{pmatrix} a(t) \\ v(t) \\ \epsilon(t) \end{pmatrix}$$

Simple matrix operations then show that the recursion value of equity will be:

$$\eta(t) = b(t) + E_t \left[\int_t^\infty e^{-i(s-t)} a(s) ds \right] + E_t \left[\int_t^\infty e^{-i(s-t)} \varepsilon(s) ds \right] = b(t) + (1,0,1)(iI - C)^{-1} y(t)$$

or:

$$\eta(t) = b(t) + \frac{[(i - c_{22})(i - c_{33} + c_{31}) + c_{32}(c_{21} - c_{23})]a(t)}{\Delta} +$$

$$\frac{[c_{12}(i - c_{33} + c_{31}) + c_{32}(i - c_{11} + c_{13})]v(t) + [(i - c_{22})(i - c_{11} + c_{13}) + c_{12}(c_{23} - c_{21})]\varepsilon(t)}{\Delta}$$

where $\Delta = \det(iI - C)$ is the determinant of the matrix $(iI - C)$.

To determine the stochastic process that generates the recursion value of equity, differentiate through the expression for $\eta(t)$ to give:

$$d\eta(t) = db(t) + (1,0,1)(iI - C)^{-1} dy(t)$$

Now since $db(t) = (a(t) + ib(t) + \varepsilon(t))dt - dD(t) = ib(t)dt + (1,0,1)y(t)dt - dD(t)$ and $dy(t) = Cy(t)dt + \eta^\delta(t)dz(t)$, it follows that:

$$d\eta(t) = ib(t)dt + (1,0,1)y(t)dt - dD(t) + (1,0,1)(iI - C)^{-1}(Cy(t)dt + \eta^\delta(t)dz(t))$$

or:

$$d\eta(t) = ib(t)dt - dD(t) + (1,0,1)[I + (iI - C)^{-1}C]y(t)dt + \eta^\delta(t)(1,0,1)(iI - C)^{-1}dz(t)$$

Note here, however, that $(iI - C)I + C = iI$ or $(iI - C)^{-1}(iI - C)I + (iI - C)^{-1}C = i(iI - C)^{-1}I$. Since $(iI - C)^{-1}(iI - C) = I$, we therefore have that $I + (iI - C)^{-1}C = i(iI - C)^{-1}$. It thus follows that $ib(t) + (1,0,1)[I + (iI - C)^{-1}C]y(t) = ib(t) + i(1,0,1)(iI - C)^{-1}y(t) = i\eta(t)$; in which case we have:

$$d\eta(t) = i\eta(t)dt - dD(t) + \eta^\delta(t)(1,0,1)(iI - C)^{-1}dz(t)$$

If we now choose the normalising constants so that

$$(iI - C)^T \begin{pmatrix} k_1^{-1} \\ k_2^{-1} \\ k_3^{-1} \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$$

where $(iI - C)^T$ is the transpose of the matrix $(iI - C)$, then it follows that the recursion value of equity evolves in accordance with the stochastic differential equation:

$$d\eta(t) = i\eta(t)dt - dD(t) + \eta^\delta(t)dq(t)$$

where $dq(t) = (dz_1(t) + dz_2(t) + dz_3(t))$ is a Wiener process with variance parameter $\zeta = \sigma_1^2 + \sigma_2^2 + \sigma_3^2 + 2\rho_{12}\sigma_1\sigma_2 + 2\rho_{13}\sigma_1\sigma_3 + 2\rho_{23}\sigma_2\sigma_3$.

Dirty surplus accounting and the real (adaptation) value of equity

Using Assumption #2 from the text, it is easy enough to follow the procedures laid down in Ashton et al. (2003:433) to show that the market value of equity will have to satisfy the fundamental valuation equation:

$$\frac{1}{2}\zeta\eta^2\delta\frac{d^2P}{d\eta^2} + (i\eta - \frac{dD}{dt})\frac{dP}{d\eta} + (\frac{dD}{dt} - iP(\eta)) = 0$$

Direct substitution shows that the recursion value of equity, $P(\eta) = \eta$, is a particular solution of this equation. Furthermore, the auxiliary equation takes the form:

$$\frac{1}{2}\zeta\eta^2\delta\frac{d^2P}{d\eta^2} + (i\eta - \frac{dD}{dt})\cdot\frac{dP}{d\eta} - iP(\eta) = 0$$

The general solution of the fundamental valuation equation will then consist of the particular solution, $P(\eta) = \eta$, plus the general solution of the auxiliary equation (Boyce and DiPrima 1969:115).

Suppose the recursion value of equity evolves in accordance with an Ashton et al. (2003) 'square root' process ($\delta = \frac{1}{2}$) and that consistent with Assumption #3, dividends are proportional to the recursion value of equity. It then follows that the real (adaptation) value of equity will be captured by the solutions of the following auxiliary equation:

$$\frac{1}{2}\zeta\eta\frac{d^2P}{d\eta^2} + (i - \alpha)\eta\frac{dP}{d\eta} - iP(\eta) = 0$$

Since there are no closed form solutions to this equation, we determine analytic solutions in the form of the power series expansion,

$$P(\eta) = \sum_{j=0}^{\infty} a_j \eta^{j+r},$$

where a_j are coefficients and r is the exponent of singularity. Substitution into the auxiliary equation shows:

$$\frac{1}{2}\zeta \sum_{j=0}^{\infty} (j+r)(j+r-1)a_j \eta^{j+r-1} + (i - \alpha) \sum_{j=1}^{\infty} (j+r-1)a_{j-1} \eta^{j+r-1} - i \sum_{j=1}^{\infty} a_{j-1} \eta^{j+r-1} = 0$$

Expanding out the term for $j = 0$ leads to the indicial equation, which is $\frac{1}{2}\zeta a_0 r(r-1)\eta^{r-1} = 0$. Hence, the exponents of singularity are $r = 0$ and $r = 1$. Now, letting $r = 1$ in the above series expression means:

$$\sum_{j=1}^{\infty} [\frac{1}{2}\zeta j(j+1)a_j + (i - \alpha)ja_{j-1} - ia_{j-1}] \eta^j = 0$$

This leads to the following recursion formula for the relationship between the coefficients of the power series expansion:

$$a_j = \frac{2(i + (\alpha - i)j)}{j(j + 1)\zeta} \cdot a_{j-1}$$

Letting $a_0 = 1$ for convenience and expanding the recursion formula shows that the following expansion is a formal solution of the auxiliary equation:¹⁵

¹⁵ The radius of convergence, R , for this series expansion is (O'Neil, 1987: 270–271):

$$R \approx \lim_{j \rightarrow \infty} \frac{1}{|\frac{2(i + (\alpha - i)j)}{j(j + 1)\zeta} \cdot a_j|} \rightarrow \infty$$

Hence, $P_1(\eta)$ is convergent for all real η , as is to be expected.

$$P_1(\eta) = \eta + \frac{\alpha(2\alpha - i)}{\zeta} \eta^2 + \frac{\alpha(2\alpha - i)(3\alpha - 2i)}{3\zeta^2} \eta^3 + \frac{\alpha(2\alpha - i)(3\alpha - 2i)(4\alpha - 3i)}{18\zeta^3} \eta^4 + \dots$$

Furthermore, by reduction of order, a second linearly independent solution will be (Boyce and DiPrima, 1969:103–104):

$$P_2(\eta) = P_1(\eta) \int_{\eta}^{\infty} \frac{\exp\left[\frac{2(\alpha - i)y}{\zeta}\right]}{P_1^2(y)} dy$$

Now, for this second solution it is easily shown that the indefinite integral,

$$\int_{0}^{\infty} \frac{\exp\left[\frac{2(\alpha - i)y}{\zeta}\right]}{P_1^2(y)} dy,$$

is non-convergent (Spiegel, 1974:264). However, applying L'Hôpital's Rule shows that (Spiegel, 1974:62):

$$\lim_{\eta \rightarrow 0} P_2(\eta) = \lim_{\eta \rightarrow 0} \frac{\exp\left[\frac{2(\alpha - i)\eta}{\zeta}\right]}{\frac{dP_1(\eta)}{d\eta}} = 1$$

Likewise, L'Hôpital's Rule also shows that:

$$\lim_{\eta \rightarrow \infty} P_2(\eta) = \lim_{\eta \rightarrow \infty} \frac{\exp\left[\frac{2(\alpha - i)\eta}{\zeta}\right]}{\frac{dP_1(\eta)}{d\eta}} = 0$$

Hence, this second solution satisfies the boundary conditions laid down in Assumption #4 and thereby captures the real (adaptation) value of equity. Furthermore, since the overall market value of equity, $P(\eta)$, is the sum of its recursion value and its real (adaptation) value, it follows that:

$$P(\eta) = \eta + P(0) \int_{\eta}^{\infty} \frac{\exp\left[\frac{2(\alpha - i)y}{\zeta}\right] P_1(y)}{P_1^2(y)} dy$$

where $P(0)$ is the ‘dormant value’ of the firm’s equity (Yee, 2000); that is, the market value of equity when the recursion value of equity approaches zero ($\eta \rightarrow 0$).

Dividends and the real (adaptation) value of equity

In the text we make the point that the real (adaptation) value of equity for a dividend paying firm will be higher than the real (adaptation) value of equity for an otherwise identical non-dividend paying firm. Table 1 summarises the real (adaptation) value of equity for two firms, both of which have a recursion value of $\eta = £1$ and a dormant value of equity of $P(0) = £1$:

Table 1

$\frac{i}{\zeta}$	<i>Non-Dividend paying</i> £	<i>Dividend paying</i> £
0.30	0.2762	0.3190
0.40	0.2009	0.2555
0.50	0.1485	0.2101
0.60	0.1111	0.1762
0.70	0.0839	0.1500
0.80	0.0638	0.1292
0.90	0.0488	0.1124
1.00	0.0375	0.0987
1.10	0.0290	0.0872
1.20	0.0225	0.0776
1.30	0.0175	0.0694
1.40	0.0136	0.0624
1.50	0.0106	0.0563
1.60	0.0083	0.0510
1.70	0.0065	0.0464
1.80	0.0051	0.0424
1.90	0.0041	0.0388
2.00	0.0032	0.0356
3.00	0.0003	0.0169
4.00	0.0000	0.0092
5.00	0.0000	0.0054
10.00	0.0000	0.0008
20.00	0.0000	0.0001

The first column in Table 1 contains the ratio of the cost of equity capital, i , to the variance parameter, ζ , for instantaneous increments in the recursion value of equity. The second column gives the real (adaptation) value of equity for a non-dividend paying firm. The third column gives the real (adaptation) value of equity for a dividend paying firm when the instantaneous dividend payment is proportional to the recursion value of equity. The constant of proportionality is equal to one half the cost of equity capital; that is, $\alpha = \frac{1}{2}$. Note that the real (adaptation) value of equity for the non-dividend firm is everywhere less than the real (adaptation) value of equity for the dividend paying firm.

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'Equity smirks' and embedded options: the shape of a firm's value function

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Abstract—This paper examines the methodology and assumptions of Ashton, D., Cooke, T., Tippett, M., Wang, P. (2004) employing recursion value η as an explanatory single-variable in a model of the firm, first introduced by Ashton, D., Cooke, T., Tippett, M., in (2003). A qualitative analysis of all of their numerical findings is given together with an indication of how more useful is the tool of special function theory, here requiring confluent hypergeometric functions associated with the Merton-style valuation equation

$$\frac{1}{2}\zeta\eta \frac{d^2V}{d\eta^2} + (r-q)\eta \frac{dV}{d\eta} - rV = 0.$$

A justification and a wider interpretation of their model and findings is offered: these come from inclusion of strictly convex dissipating frictions arising either as insurance costs, replacement costs of funds paid out, or of debt service, and from the inclusion of alternative adaptation options embedded in the equity value of a firm; these predict not only a J-shaped equity curve, but also, under the richer modelling assumption, a snake-like curve that may result from financial frictions like insurance. These 'smirks' in the equity curve may be empirically tested. It is shown that the inclusion of frictions in dividend selection (e.g. the signalling costs of Bhattacharya, 1979) leads to an optimal dividend payout of $\alpha\eta$ that is a constant coupon for an interval of η values preceded by an interval in which $\alpha = r$; this is at variance with the ACTW model where the exogenous assumption of a constant α is made.

1. Introduction

Ashton, D., Cooke, T. and Tippett, M. (2003) and Ashton, D., Cooke, T., Tippett, M. and Wang, P. (2004), henceforth referred to as ACTW, offer an elegant and ground-breaking continuous-time model for the evolution of accounting values over time, blending the approaches of accounting theory and finance theory. The significance of the analysis in ACTW is threefold: first, it gives an insight – through the prism of an accounting variable – into how a firm's dividend policy has a controlling role in the determination of equity value; second, it explains in terms of one type of embedded option an important empirical observation regarding the J-shaped functional relation between earnings and equity, a feature not explicitly modelled until quite recently – see also Gietzmann and Ostaszewski (2004); and third (though this may be seen as secondary to the main thrust of the argument), it admits the so-called dirty surplus ac-

counting systems (i.e., it allows earnings to be partitioned into exceptional and non-exceptional with both these evolving separately, though not necessarily independently).

The essential assumption of ACTW is the adoption of so-called recursion-value, denoted by η as the explanatory variable. This variable is at any time the expected present value of the future dividend stream, given the current information, and contingent on the assumption that the production technology/environment is to remain unchanged. They examine a specific stochastic model written in accounting terms, namely the natural, constant-matrix, continuous-time generalisation of the Ohlson (1995) discrete-time linear model as governing the evolution of earnings, with uncertainty modelled by a square-root process driven by η . Theirs is thus a state space model with

$$dy = Cydt + \eta^\delta dz_i, \quad (1)$$

where abnormal earnings a , dirty surplus adjustment ε and one additional information variable v make up the state vector at any instant, y , while z_i is a vector of Brownian motions, and δ is assumed not to exceed 1/2. The technology regime thus remains unchanged as long as the matrix C at the heart of the model is constant. They also assume the firm has access to alternative modes of operation giving it what they term an 'adaptation value'. Further simplifying assumptions (several) lead them to an ordinary differential equation for the valuation of the firm and to a unique solution which

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exhibits the J-shape. Based on this solution function, ACTW conduct comparative statics to show the influence of dividend policy over equity value.

The simplifying assumptions are: a single sde, a specific dividend policy and just one type of adaptation technology which is characteristic of a firm entering a contraction phase.

The first aim of the current paper is to widen the argument, so as to support the simplifying assumptions, given the remarkable insight ACTW offer. Such an argument is called for, since the assumptions are contentious on the grounds of an apparent inconsistency with the starting linear model. The second aim is to widen the perspective, so as to embrace a richer structure of embedded options, including not only contraction options but also expansion options; this opens up an analysis of firms according to their embedded option structure, and a realisation that J-shapes are not the only shapes that may be observed; we indicate a contrasting 'snake-like' shape driven by a 'cost of finance' friction. A third aim is to offer two further simplifications: one in respect of the method employed for solving the underlying differential equation (in particular this insight rids the model of an unrealistic 'cusp-like' feature – a vertical tangency at the origin), but more significantly is more helpful to analysing the solutions than quadrature (which ACTW use to investigate their own integral representation of the solution); the other simplification is in respect of the comparative statics which are here derived from an even simpler perspective (a stripping down to an appropriate exponential decay, which is thus seen to be an important controlling feature of the value function). A final aim is to endogenise the choice of dividend policy. It will be clear from the analysis here that the next step in a research programme is to perform a taxonomy of switching models consistent with the multitude of qualitatively different solutions available by 'patching solutions' from a collection of broadly similar, underlying, differential equations.

The structure of this paper is the following. A brief description generalizing some aspects of the model is given first. Various consequences of the

ACTW paradigm and an apparent inconsistency is analysed as a thought experiment; then reference to the Bugstahler-Dichev (1997) model which inspires the ACTW paradigm indicates why, in principle, smooth-pasting of solutions from two differential equations is a must, and why, nonetheless, the simplification adopted by ACTW is justifiable. In Section 4.2 a qualitative analysis of the single differential equation approach is given and it is shown that introduction of a friction term not only removes the 'cusp-like' feature on the short lip of the J-shape, but also permits a snake-like shape. Comparative statics from a simplified perspective are given in Section 7 and these relate to issues of monotonicity (in μ), location of the minimum equity value ('the bottom of the smirk'), and comparison against the non-dividend regime. The final section considers endogenizing the dividend policy when frictions are included; there is a growing literature concerned with dividend policy as a control variable and just a few recent papers are cited. The conclusion short-lists how this approach might throw further light on a more significant number of dividend-related questions. The Appendix collects proofs, and en passant, a brief summary of some pertinent facts concerning the solution of the confluent hypergeometric differential equation (which is at the heart of the ACTW model) in terms of series expansion. An extended website version of this paper indicates how to apply an incomplete Laplace Transform approaches to the equation.¹

2. A more general model

ACTW have as a starting point the introduction of a continuous variable $\epsilon(t)$ which is the instantaneous value of the so-called exceptional items (the dirty surplus adjustment) with the consequence that cost of capital i is charged only to adjusted earnings (excess) earnings $x(t)$; residual income/abnormal earnings are thus defined instantaneously by

$$a = x - ib,$$

so that unadjusted earnings over an interval of length Δt are $(x + \epsilon)\Delta t$; here i denotes the riskless interest rate, as in ACTW. The modelling of firm value proceeds by connecting the value of assets in hand (book value, i.e. historic value of the assets held by the firm) and the expectation of the discounted stream of future dividends (see Miller and Modigliani (1961)) and begins by writing change in the book value b as a change in earnings less dividend payout:

$$db = (x + \epsilon)dt - dD = (ib + a + \epsilon)dt - dD, \quad (2)$$

where $D = D(t)$ denotes at time t the cumulative

¹ Since $V(0+)$ is liable to be infinite, one should employ the incomplete transform:

$$L_\delta(f) = \int_0^\infty f(t)e^{-\delta t} dt$$

and the associated rules

$$\begin{aligned} L_\delta(f(t)) &= -\frac{d}{ds}L_\delta(f), \quad L_\delta(f') = sL_\delta(f) - f(\delta)e^{-\delta s}, \\ L_\delta(f'') &= s^2L_\delta(f) - f(\delta)s e^{-\delta s} - f'(\delta)e^{-\delta s}. \end{aligned}$$

Then in passing to the limit refer to $\lim_{\delta \rightarrow 0} \delta f(\delta) = \lim_{\delta \rightarrow 0} \delta f'(0) = 0$. See the website version of the paper at www.maths.lse.ac.uk/Personal/adam, or www.cdam.lse.ac.uk/Reports/reports2004.html

outflows from the firm (dividends in the ACTW case). Define

$$\eta = E\left[\int_0^\infty e^{-\kappa t} dD(t)\right]. \quad (3)$$

Absent any bubble phenomena at infinity, i.e. assuming

$$\lim_{t \rightarrow \infty} e^{-\kappa t} b_t = 0 \quad (4)$$

integration by parts gives

$$\begin{aligned} \int_0^\infty e^{-\kappa t} dD(t) &= \int_0^\infty e^{-\kappa t} [ib + a + \varepsilon] dt - \int_0^\infty e^{-\kappa t} db \\ &= \int_0^\infty e^{-\kappa t} [ib + a + \varepsilon] dt - \left([e^{-\kappa t} b]_0^\infty + i \int_0^\infty b e^{-\kappa t} dt \right) \\ &= b_0 + \int_0^\infty e^{-\kappa t} [a + \varepsilon] dt. \end{aligned} \quad (5)$$

The expected value on the left-hand side is interpreted as the recursion value of the firm denoted η and this assumes the firm's existing investment opportunity set will remain in force indefinitely – with opportunity set defined by the modelling assumption of the linear C system given by (1).

We begin by observing the following.

Proposition 1. *With η defined by (3) and assuming the dynamics of bookvalue given by (2) satisfy (4), we have that*

$$E[d\eta_t] = i\eta_t dt - dD(t),$$

provided the processes $(a(t), v(t), \varepsilon(t))$ are continuous and $D(t)$ is non-anticipating, e.g. $D(t) = f(\eta(t))dt$ for some deterministic function $f(.)$.

In particular, if a and ε are given by the linear stochastic differential equation (1), then for some combination q of the original noise generators,

$$d\eta = i\eta dt - dD + \zeta \eta^\delta dq.$$

Proof. See Appendix 1. The particular case of (1) is proved in ACTW and we note that the combination q is independent of the state vector $(a(t), v(t), \varepsilon(t))$.

It follows that a stochastic model based on a standard Wiener process z_t will take the form

$$d\eta_t = i\eta_t dt - dD(t) + \zeta(\eta_t) dz_t,$$

and ACTW study the case

$$\zeta(\eta) = \zeta_0 \eta^{1/2}$$

with ζ_0 a positive constant. Their theorem identifies the constant ζ_0 corresponding to the linear model (1) in terms of the Wiener processes gener-

ating $a(t), v(t), \varepsilon(t)$.

We now consider a variant of the ACTW deterministic dividend policy in which the firm makes two payments: a constant coupon C per unit time and a proportion $\alpha(\eta)$ of the recursive value η . The coupon may be thought of as a constant debt-service covenant, but other interpretations are also appropriate (see section 8); this component is absent in the ACTW model but we need it at two junctions, in particular to remove the 'cusp-like' phenomenon (infinite slope at the origin).

Assuming therefore that for all time

$$d\eta = i\eta dt - dD + \zeta(\eta) dz$$

and that for some deterministic function $\alpha(.)$ it is the case that

$$dD(t) = [\alpha(\eta(t))\eta + C]dt,$$

then the equity value satisfies the equation

$$\frac{1}{2} \zeta(\eta)^2 \frac{d^2 V}{d\eta^2} + (i\eta - \alpha\eta - C) \frac{dV}{d\eta} - iV + \alpha\eta + C = 0. \quad (7)$$

Note that $V = \eta$ is a particular solution (as it must be in the absence of any switching options), so that the general solution is given by:

$$V(\eta) = \eta + W(\eta),$$

where W solves the complementary equation

$$\frac{1}{2} \zeta(\eta)^2 \frac{d^2 W}{d\eta^2} + ((i - \alpha)\eta - C) \frac{dW}{d\eta} - iW = 0. \quad (8)$$

This is a minor modification to a well-known argument attributed to Merton (1974); see also Black and Cox (1975).

For the case $\zeta(\eta) = \sqrt{\zeta}\eta$ with ζ a positive constant, rescaling the independent variable to $y = 2\lambda\eta$, where $\lambda = 2(i - \alpha)/\zeta$ assuming that $\alpha < i$, and tidying up of parameters (by setting $\kappa = i/(i - \alpha)$ and $c = 2C/\zeta$) we find that the format of the governing differential equation is thus

$$y \frac{d^2 W}{dy^2} + (y - c) \frac{dW}{dy} - \kappa W = 0. \quad (9)$$

We will refer to this as the generalised Merton valuation equation. It may be solved by reference to the Kummer equation. The latter is obtained from (9) by setting $x = -y$ and $w(x) = W(y)$ and writing² $A = -\kappa$ and $B = -c$, so that

$$x \frac{d^2 w}{dx^2} + (B - x) \frac{dw}{dx} - Aw = 0. \quad (10)$$

There are a number of established special functions which may be used to solve the equation (10) and mention should be made in particular of the Kummer functions and of the Whittaker functions. See Slater (1960). In Section 4.3 two independent

² Traditional notation, see Slater (1960), uses lower case letters which we avoid since a, b already denote abnormal earnings and book-value.

solutions of (10) of financial significance are found to be given by the Kummer functions $M(A, B, x)$ and $U(A, B, x)$ so that the Merton valuation equation has the two solutions

$$C(y) = M(-\kappa, -c, -y), \quad P(y) = U(-\kappa, -c, -y).$$

An alternative notation for $M(A, B, x)$ is ${}_1F_1(A; B; x)$ a notation which refers to the coefficients in the hypergeometric series expansion of the Kummer function M .³ The reader should be warned that in the domain of financial interest there are potential difficulties in accessing the special functions on computer (problems with integer values for A, B). Some useful formulas are collected in Appendix 2 for ease of reference.

There is an immediate payoff to this extra level of generality: in the special case of $c = \kappa$ the equation (9) has an obvious put-like solution: $W(y) = e^{-y}$. Its call-like second solution is close to being a simple power function y^κ . See Section 6. This makes the model a hybrid of the arithmetic Brownian (with exponential solution) and geometric Brownian (with power solution).

3. Consequences of aggregation and the simplifying paradigm

ACTW derive two consequences of the modelling assumption (1).

The first is that in such a framework the current value of η can be expressed in terms of book-value and the current state variables in the form

$$\eta(t) = b(t) + H \begin{pmatrix} a \\ v \\ \epsilon \end{pmatrix}, \quad (11)$$

where $H = (1, 0, 1)(iI - C)^{-1}$ is a row vector computed from C . It is tacitly assumed that i is not an eigenvalue of C . Though ACTW do not consider this point, it is a justified enquiry, given that optimal activity is predicated on η alone, whether, at least in principle, the state vector $(a(t), v(t), \epsilon(t))$ is recoverable from knowledge of η obtained within some, or any (no matter even how short), time interval starting at t . Set the volatility to zero for a simpler and more achievable task and the answer is no. This makes the findings of ACTW all the more remarkable.

Proposition 2. *The state vector $(a(t), v(t), \epsilon(t))$ of the linear system C given by (1) is not recoverable from knowledge of η obtained within some, or any (no matter even how short), time interval starting at t .*

Proof. The reconstruction question has a well-known equivalent in the deterministic setting (see Russell, 1979); the equivalent statement is that the following matrix has rank 3. We compute the form

of the required matrix to be

$$\begin{bmatrix} H \\ HC \\ HC^2 \end{bmatrix} = \begin{bmatrix} (1, 0, 1)(iI - C)^{-1} \\ (1, 0, 1)(iI - C)^{-1}C \\ (1, 0, 1)(iI - C)^{-1}C^2 \end{bmatrix} = \begin{bmatrix} (1, 0, 1)(iI - C)^{-1} \\ (1, 0, 1)[i(iI - C)^{-1} - I] \\ (1, 0, 1)[i^2(iI - C)^{-1} - (1+i)I] \end{bmatrix} \\ = \begin{bmatrix} H \\ iH - (1, 0, 1) \\ i^2H - (1+i)(1, 0, 1) \end{bmatrix}$$

since

$$(iI - C)^{-1}C = i(iI - C)^{-1} - I, \\ (iI - C)^{-1}C^2 = i(iI - C)^{-1}C - C = i^2(iI - C)^{-1} - iI - I.$$

However, this matrix cannot have rank 3, since after subtracting appropriate multiples of H we obtain the equivalent matrix

$$\begin{bmatrix} H \\ (1, 0, 1) \\ (1+i)(1, 0, 1) \end{bmatrix}$$

which has rank at most 2.

Second, they show that since the stochastic driver for each accounting variable is a square-root process in η , it follows that the stochastic differential equation obeyed by η is

$$d\eta_t = i\eta_t dt - dD(t) + \zeta\eta_t^{1/2} dz_t, \quad (12)$$

where i is the required rate of return on investment, $D(t)$ is the cumulative dividend, ζ is a positive volatility constant and z_t is a Wiener process (derived as a linear combination of the Wiener processes driving the assumed linear system). The equation (12) is critical to the ground-breaking developments from here on.

ACTW at this point show that it is possible to abandon the state-space model of a firm, run essentially by noise, in favour of a managed firm. In the managed firm managers monitor at each moment the expected value of the sum total of discounted dividends, η , assuming no intervention, but may, if they so choose, intervene and so let the firm run under a different technology. This option to switch adds value to the firm, lifting it from the original η to $V(\eta)$. ACTW assume that (12) holds for all time. Though they do not say this, the implication of the assumption is that even when the firm has switched to a different technology, at which stage the corresponding new variable η might have evolved differently, they assume that volatility is unchanged. (The assumption thus excludes investment of liquidated value in government bonds of zero volatility, in favour of

³ The n -th term of the series ${}_pF_q(\mathbf{a}; \mathbf{b}; t)$ is

$$\frac{[a_1(a_1+1)\dots(a_1+n-1)]\dots[a_p(a_p+1)\dots(a_p+n-1)]}{[b_1(b_1+1)\dots(b_1+n-1)]\dots[b_q(b_q+1)\dots(b_q+n-1)]} \frac{t^p}{n!}.$$

technologies more in keeping with the original model C .) They also assume that the firm pursues throughout time an exogeneously selected proportionate dividend policy whereby

$$dD(t) = \alpha \cdot \eta dt, \quad (13)$$

with α a constant. Assuming $0 < \alpha < i$ this form of dividend ensures that the firm continues to have value (is not expected to go bankrupt). ACTW thus in effect posit that the infinitely-lived firm's value $V(\eta)$ is a Merton-style perpetual option written on η with η regarded as a traded asset and with price described by (12). This satisfies an ordinary differential equation which is the time-invariant generalisation of the Black-Scholes equation when inflows and outflows of cash occur in the firm. We will refer to it simply as the standard Merton valuation equation. Here it takes the form

$$\frac{1}{2} \zeta \eta \frac{d^2V}{d\eta^2} + (i - \alpha)\eta \frac{dV}{d\eta} - iV + \alpha\eta = 0. \quad (14)$$

ACTW go on to assume that the option to switch out of recurring activity is one which is only attractive at low values of η (see below for details); this single assumption enables them to identify a unique function $P(\eta)$ such that $V(\eta) = \eta + P(\eta)$ solves (14), so that $P(\eta)$ identifies the value of such an adaptation option. Let us call this real option, the adaptation put. Given that η is a particular solution of (14), the function $P(\eta)$ is of course a solution to the complementary equation obtained from (14) by setting $V(\eta) = \eta + W(\eta)$, where

$$\frac{1}{2} \zeta \eta \frac{d^2W}{d\eta^2} + (i - \alpha)\eta \frac{dW}{d\eta} - iW = 0. \quad (15)$$

The assumptions which lead to a unique adaptation put may be likened to the cutting of the Gordian knot rather than to its unravelling. There is a devil of a potential over-simplification; yet in this special case the approach is instrumental to yielding a valuable insight. We offer explanations in the next sections, warning the reader that assumptions alternative to having (12) hold for all η would lead to alternative adaptation put functions (especially so if the alternative is investment in high-grade bonds).

In summary: set aside any particular choice of linear model C for the variables $a(t), v(t), \varepsilon(t)$, and instead take as starting point (6); if we assume that (12) holds for some $\zeta = \zeta(\eta)$ then (14) describes the value of the claim on η . For the simplest model, with ζ a constant, it is possible to characterise all non-negative solutions. This is done in Section 4.

3.1. A thought experiment for and against the simplification paradigm

We indulge in what is only a thought experiment

to understand the status of the assumptions ACTW make. If the firm has one mode/technology of operation, say that described by C above, then its equity value at any time t is given by $\eta_C(t)$ (as a discounted sum of dividends) governed by (12) in which $\zeta = \zeta(C)$. Suppose that the firm has access to alternative technology to which it may switch its operation by transferring all resources to it, i.e., it may at a time of its own choosing replace C by a matrix \bar{C} . This is supposed to be its 'adaptation technology'. In the new context its equity value, as determined by \bar{C} , is $\eta_{\bar{C}}(t)$ with a stochastic differential equation formally like (12) though in general with a different volatility $\zeta = \zeta(\bar{C})$. At this point it is worth referring to the paper by Radner and Shepp (1996) where switching to alternative technologies leads to a change both in drift and in volatility; but note that there the state variable is quite different, as it represents accumulated net revenue and allows for bankruptcy.

Returning to the thought experiment, if the switch occurs at a time θ when $\eta_C(\theta)$ first achieves some appropriate moving target $\bar{\eta}(t)$, the equity value thereafter is given by the process $\eta_{\bar{C}}(t)$ started at the target value (assuming no further switches are allowed). If the governing equation is still (12), i.e. $\zeta(C) = \zeta(\bar{C})$ then it is difficult to distinguish between the two modes of operation from only a knowledge of η and the need for a switch is placed in doubt (particularly, as neither system is likely to be reconstructible from a knowledge of only η). Assume now that the volatilities are distinct. At any time t the target value $\bar{\eta}(t)$ for switching must depend on all of: C, \bar{C} , perhaps $\eta(t)$, as well possibly as t (but given the infinite horizon and the stationary framework this should immediately be ignored), and presumably, though not necessarily, on the vector of state variables $(a(t), v(t), \varepsilon(t))$. This latter point is a subtle one, but ACTW have implicitly shown elsewhere (footnote 14 in Ashton, D., Cooke, T., Tippett (2003)) that the consequence of writing $V = V(b, a, v, \varepsilon; C, \bar{C})$ is a valuation equation that is a pde in the variables b, a, v, ε and that the assumption that this equation has a solution in the form $v = V(\eta, C, \bar{C})$, given the linear form (11), reduces the pde to the ode (14). An invocation of a uniqueness theorem (for the solution of the pde), then validates the intuition that $\eta(t)$ is enough! Hence the form of the optimal switching policy is that η achieves a target value $\bar{\eta} = \bar{\eta}(C, \bar{C})$.

So assuming it is enough to know η to determine the optimal switching, the value of the firm at time t takes the form $V(\eta(t))$. It follows that the functional equation

$$V(\eta) = dD(t) + e^{-kt} E[V(\eta + d\eta)), \quad (16)$$

correctly describes the equilibrium valuation V of

the dividend flow, i being the required rate of return.⁴ To deduce a Merton valuation equation one in principle needs to assume as data a form for the volatility term on each side of the switching point $\bar{\eta}$. Writing this in the form $\zeta = \zeta(\eta)$ and expanding (16) via Itô's Formula then gives the Dynkin-Kolmogorov differential equation (see Oksendal, 1998) satisfied by V to be

$$\frac{1}{2}\zeta(\eta)^2 \frac{d^2V}{d\eta^2} + (i - \alpha)\eta \frac{dV}{d\eta} - iV + \sigma\eta = 0,$$

compare Radner and Shepp (1996).

ACTW side-step this kind of thought experiment and simply posit that the condition (16) holds alongside of (12) and (13); the upshot of these is that $\zeta(\eta)$ is taken to be a constant multiple of η (i.e. either as though changes in ζ away from $\eta = 0$ are largely irrelevant as regards the qualitative behaviour, or as though $\zeta(C) = \zeta(\bar{C})$ which might at best be regarded as a limiting scenario). ACTW thus arrive at the Merton valuation equation in the form (14). We will see, from later sections, that little is lost as a result of the simplifying assumption, insofar as the qualitative features of the associated put option are concerned.

3.2. The Burgstahler-Dichev paradigm: smooth pasting

Though the ACTW approach is motivated by the Burgstahler-Dichev (1997) approach to firm value, it should be regarded as a generalisation *not* of the Burgstahler-Dichev call option paradigm, but of the Merton perpetual put-option paradigm as we show below. This involves smooth pasting a time-independent solution of the Black-Scholes equation on to the exercise value of a put. By passing to a square-root process, ACTW alter the geometry significantly enough to agree with empirical findings. However, they side-step the need for a smooth-pasting between the exercise value and waiting value by assuming that both regimes are described by one equation. We will show that this rolling together leads to no loss in qualitative behaviour.

Burgstahler-Dichev posited a convex, increasing functional relation between earnings and market value, modelled after Black-Scholes as a call option on the next period earnings. Grounds for this latter view on value are that the firm exercises a call-like real-option in the form of a simple switching opportunity. The interpretation is that either the firm may stick with their recurring activity (which is assumed to offer a future value proportionate to earnings), or abandon this in the very next period. It would opt for abandonment, if the future value of recurring activity is too low, as compared to

'adapting' their behaviour to a superior value. This latter action, however, offers only a flat (constant) value over the whole range of earnings, and so is only superior at low earnings. We note that this corresponds to taking $\eta = K = \text{const}$ as the governing equation for low η in lieu of (12).

Empirical tests found justification in the data for convexity, but surprisingly detected an initial portion of the functional relation to be downward sloping rather than flat (a portion corresponding to an up-turn in value as earnings fall). Of course our summary of the Burgstahler-Dichev approach shows it to be in reality a two-period model since it is inconceivable that the recurrent activity should give a linear future value curve. ACTW side-step a proper inductive (= recursive) treatment of the Burgstahler-Dichev paradigm in discrete time, by passing to continuous time where the Bellman equation, in this case an ordinary differential equation, replaces the induction step.

A review of the well-known perpetual put argument is profitable here. This argument is in continuous time, so different in flavour from that of Burgstahler-Dichev as summarised above. Suppose given a fixed dividend payout rate $\alpha\eta$, then the following stochastic differential equation is consistent with Proposition 1 above, namely

$$d\eta_t = (i - \alpha)\eta dt + \sigma\eta dz_t. \quad (17)$$

A volatility term of $\sigma\eta$ is ruled out for ACTW if the equation is to hold for all time (all η), since they seek a put-like solution, and in the case $\zeta(\eta) = \sigma\eta$ the put-like solution has, as is well-known, a singularity (blow up) at the origin. For the present pasting purposes, however, it is a perfectly admissible alternative to $\zeta^{1/2}\eta^{1/2}$, as long as this volatility form is avoided near zero by the exercise of an alternative choice of technology near the origin. The equation (17) treats η just like a standard dividend-paying traded asset. At any future moment in time, management have an American perpetual option: either to receive a value K (by switching to the adaptation technology), or to continue with the recurring activity (and so holding onto an asset worth η). If $\eta > K$ there is no value to be had from exercise, and so the current value of the firm is η ; but for $\eta < K$, one should consider exercise of the switching option in order to receive a value $V = K = \eta + (K - \eta)^+$.

The optimal trigger for switching, $\bar{\eta}$, is well-known to be characterized here by the Black-Scholes equation for the perpetual put $P = (K - \eta)^+$ namely

$$\frac{1}{2}\sigma^2\eta^2 \frac{d^2P}{d\eta^2} + (i - \alpha)\eta \frac{dP}{d\eta} - iP = 0, \quad (18)$$

insofar as it stays valid for $\eta > \bar{\eta}$ (while the put remains unexercised), alongside the smooth-pasting

⁴ Here we follow ACTW in interpreting expectations in the sense of Rubinstein (1974). See ACTW footnote 6.

condition: $P'(\bar{\eta}) = -1$. The latter condition may be viewed as a pasting together of two solutions: one from the Black-Scholes equation (18) and the other from the more trivial differential equation $P'(\eta) = -1$ (obeyed by $P = K - \eta$); in addition the pasting requires continuity of both the value function P and its derivative⁵ P' . The solution function for $\eta > \bar{\eta}$ is a declining inverse power function (with the power typically below unity⁶) albeit with an initial linear portion of slope -1 . It is the linear portion that produces a flat initial portion for $V(\eta) = \eta + P(\eta)$ which is at odds with empirical findings exhibiting an up-turn on approach to the origin.

ACTW move away from the geometric Brownian model to a square root-process and ditch the patching of two solutions from two differential equations; they thus obtain a put that is ‘in the large’ a product of a not too dissimilar inverse power⁷ and a decaying exponential solution. Close to the origin the option value is finite (although its slope is large, in the limit it is $-\infty$), and so the put is now consistent with the empirical findings. It is possible (see Section 5) to bring down the infinite slope to a more meaningful finite value by introducing financial frictions.

A more general application of the ACTW approach would patch two qualitatively similar put-like functions obtained from two different but similarly structured differential equations; but, despite the additional intellectual cost, this would achieve qualitatively the same result as from the simplifying ACTW assumption.

⁵ The usual considerations apply to the two differential equations. Suppose $P_0(\eta)$ is the appropriate value function for η in $(0, c)$ obtained from one ode. Then the solution $P(\eta, c)$ obtained by solving the other d.e. to the right of $\eta = c$ is subject to inter alia the boundary condition $P(c, c) = P_0(c)$. That yields on differentiation

$$P'_0(c) = P_\eta(c, c) + P_c(c, c) = P_\eta(c, c).$$

Indeed, the optimal choice of c is to maximise option-value and this requires at $\eta = c$ the maximisation of $P(\eta, c)$, i.e. that $P(c, c + h)$ is to be maximised at $h = 0$.

⁶ Pass to dimensionless rates by letting

$$\rho = \frac{2i}{\sigma^2}, \delta = \frac{2\alpha}{\sigma^2}$$

and for simplicity setting $\rho = 1$, an acceptable bench-mark value, we get the negative power to be $-\beta$ where

$$\beta = \sqrt{1 + (\delta/2)^2} - \frac{\delta}{2} = 1 - \frac{1}{2}\delta + \frac{\delta^2}{8} + \dots$$

which for small δ is below unity.

⁷ The power will be numerically somewhat greater if we again take the dimensionless ‘required rate’ at its benchmark value of unity and assume a small dimensionless dividend rate. Here the power will be $-\kappa = i/(i - \alpha)$, or around $-(1 + \delta)$, as opposed to $-1 + \delta/2$.

⁸ It is motivated by complex variable considerations.

4. Valuation equation: a qualitative analysis

ACTW obtain an integral representation of the solution of the Merton valuation equation (14) and use numerical integration in order (i) to plot the adaptation value against η and (ii) to perform comparative statics in relation to varying the dividend policy. For this approach asymptotic considerations are a technical necessity. However an alternative route is proposed here based on qualitative considerations of the ode and on series expansions of the solution; these seem more appropriate, since much interest centers on values of η near the origin. Some simple manipulations, routine to the theory of differential equations, offer key insights (and a route to a valid proof). Consideration of the comparative statics is delayed to Section 7.

One’s first focus of attention is to check whether there are two independent solutions (as (15) is of second order) capable of being fundamental from a financial viewpoint. One expects following the classic example of Merton-style perpetual options, see Merton (1973), to have a put-like solution as well as a call-like solution.

4.1. Tidying up to get Kummer’s equation

Introduce the notation

$$\lambda = \frac{i - \alpha}{\zeta} > 0, \quad \mu = \frac{i}{\zeta} > 0, \quad \kappa = \frac{\mu}{\lambda} = \frac{i}{i - \alpha} \geq 1, \quad (19)$$

so that in particular the dividend rate relative to the required rate, namely α/i is $(\kappa - 1)/\kappa$. Now (15) becomes

$$W''(\eta) + 2\lambda W'(\eta) - \frac{2\mu}{\eta} W(\eta) = 0, \quad (20)$$

and if $\lambda > 0$ the scale change $y = 2\lambda\eta$ is appropriate, so that putting $W(\eta) = Q(y) = Q(2\lambda\eta)$, yields

$$yQ'' + yQ' - \kappa Q = 0. \quad (21)$$

The integer values $\kappa = 1, 2$ are considered in ACTW. The case $\lambda = 0$ is considered in Appendix 3. A further variable change, unexpected for the present financial context⁸, namely the central reflection $x = -y$, and $Q(y) = U(x) = U(-y)$, lead to

$$xU'' - xU' + \kappa U = 0,$$

a case of the well-studied confluent hypergeometric equation (or, Kummer’s equation):

$$xy'' + (B - x)y' - Ay = 0,$$

quoting temporarily the notation after Slater (1960), to which we refer for a full treatment of this equation. The theoretical considerations shown there work at their smoothest when A and B avoid certain integer values, so that integer values

for A and B require special fixes. From the finance perspective these are however values of interest (indeed in ACTW we have $B = 0$ as well as $A = -1, -2$). Salient features are collected below in Appendix 2.

The conclusion is that special function theory (and the confluent hypergeometric functions are part of the menagerie) is here to stay and help. So one naturally asks for the significance of a non-zero B parameter. This corresponds to a constant inflow, or outflow, of value on top of the dividend, possibly from frictions like costs or debt service (see section 8).

4.2. Qualitative behaviour: puts, calls and the 'smirk'

The differential equation (20) may also be usefully transformed by setting

$$W = e^{-2\eta} Q$$

to the normalised form from which the first derivative is absent, see e.g. Ince (1956:394), or Slater (1960):

$$Q'' = \left(\lambda^2 + \frac{2\mu}{\eta} \right) Q,$$

a form much like that studied by Whittaker (see Whittaker and Watson, 1946). Hence, positive solutions Q (if any) are convex for $\eta > 0$ and there are two asymptotic exponential forms $e^{\pm\lambda\eta}$ for large η . The insight that positive solutions of (20) are also convex is immediate, but the argument is not fully accurate and requires an overlay based on the observation that Q may only have local minima for $Q > 0$ and only local maxima for $Q < 0$. (The argument here counters potential undesirable effects that the transforming exponential factor from Q to W might have.) This overlay also shows that positive solutions do exist with $Q(0) > 0$, since unbounded positive solutions exist for large η , and such solutions cannot have a negative local minimum. For fixed κ, λ the solutions form a one-parameter family (up to a scalar multiplier) and so the family of positive solutions with $Q(0) > 0$ will contain one member with its minimum at infinity.

In summary we have the following characterisation theorem.

Proposition. Any solution of the linear differential equation (20) with $\lambda, \mu > 0$ satisfying $W(0) > 0$ and $W(+\infty) = 0$ is a strictly convex decreasing function asymptotically of the form

$$A\eta^{-\kappa} e^{-2\lambda\eta} \{1 + O(\eta^{-1})\}$$

for some positive constant A .

Positive solutions of the equation, i.e. with $W(0) > 0$, have $W'(0+) = -\infty$ (a 'cusp-like' feature) and have in general one local minimum possibly at in-

finity after which they are monotonic, increasing, unbounded and of the form

$$A\eta^\kappa \{1 + O(\eta^{-1})\};$$

the exception is the one decreasing function asymptotic to zero as $\eta \rightarrow \infty$ (whose local minimum is at infinity).

Non-negative solutions of the equation with $W(0) = 0$ are monotonic, increasing, unbounded and of the form

$$A\eta^\kappa \{1 + O(\eta^{-1})\}.$$

Proof. The asymptotic results follow from corresponding assertions regarding the Whittaker functions. See Whittaker and Watson (1946).

Note that in this last result for large η it is plausible that the volatility should play an insignificant role in determining equity value. The effect on (15) of setting $\zeta = 0$ is the corresponding first-order equation

$$\eta \frac{dW}{d\eta} = \frac{i}{i-\alpha} W = \kappa W,$$

whose solutions are multiples of

$$W = \eta^\kappa,$$

in agreement with the proposition.

The proposition confirms that there are two independent monotonic solutions, one which is put-like, being decreasing and zero at infinity, which we might denote $W(\eta) = P_\kappa(2\lambda\eta)$, identified by requiring additionally that $W(0) = 1$, and the other, which is call-like, since it is zero at the origin, increasing and unbounded, which we might denote $W(\eta) = C_\kappa(2\lambda\eta)$, identified by requiring additionally that $W'(0) = 1$.

A stronger conclusion follows in regard to the J-shaped equity value: the equity 'smirk' subsists in all of these non-negative solutions, not merely in the put-like case.

⁹ The modified Bessel equation of order v takes the form (Abramowitz and Stegun, 1970: 374)

$$x^2 w'' + xw' - (x^2 + v^2)w = 0,$$

with solutions $I_v(x)$ and $K_v(x)$. When $v = 1$ the substitution $y = \sqrt{x} w(\sqrt{x})$ yields

$$xy'' = \frac{1}{4}y.$$

The further substitution $x = 4t$ and $z(t) = tz''(t) = z$, so the solution of the latter is seen to be

$$z(t) = y(x/4) = \frac{\sqrt{x}}{2} w\left(\frac{\sqrt{x}}{2}\right),$$

a well-known result. (See Abramowitz and Stegun, 1970: 374 for graphs, and p.506 for the limiting case of the confluent functions.)

Remark. The proposition extends to the solution functions of the general valuation equation (9) provided the coupon is not too large; for this extension it is sufficient that

$$c < 2\kappa.$$

Indeed, the normalised form for

$$y \frac{d^2W}{dy^2} + (y - c) \frac{dW}{dy} - \kappa W = 0$$

is

$$\mathcal{Q}''(x) = J(x)\mathcal{Q}(x),$$

where

$$J(x) = \frac{1}{4} + (\kappa - \frac{1}{2}c) \frac{1}{x} + \frac{1}{4}((c+1)^2 - 1) \frac{1}{x^2}.$$

For details see Bender and Orszag (1999: 88) with regard to the Schrödinger equation, or Miller (1950).

4.3. The fundamental solutions

Both these positive solutions are in the classical menagerie of special functions and may be computed using infinite series and the logarithm function (see Appendix 2). Alternatively, they may be accessed by Laplace Transforms (see the website version of this paper referenced in footnote 1 at the end of Section 1). The put-like option is decreasing and is attractive when small earnings are indicated by η , so corresponds to a firm's option for entering *contraction* in their activity; the other is increasing and is increasingly attractive when large earnings are indicated by η so corresponds to *expansion*. A second order equation in one variable permits therefore two kinds of adaptation. ACTW focus on the decreasing put-like option $P_\kappa(\eta)$ which is appropriate if one wishes to recreate an analogue to Bugstahler and Dichev's constant value option. In consequence ACTW ignore the more general circumstances where a company may also have multiple options. In general the model predicts a valuation of the form

$$V(\eta) = \eta + A \cdot P_\kappa(2\lambda\eta) + B \cdot C_\kappa(2\lambda\eta).$$

This result should be compared and contrasted with the microeconomic model of Gietzmann and Ostaszewski (2004) where there are three options, in general: to contract, to expand and to partition inputs across time, and unsurprisingly there are two state variables (if time is disregarded).

As for the functions $C_\kappa(x)$ these take a gratifyingly simple form being polynomials of degree κ for integer values of κ , where the values correspond, respectively, to $\alpha = 0, i/2, \dots$, i.e. to dividends of zero, half the required rate of return,

two-thirds etc (since $\alpha/i = (\kappa - 1)/\kappa$). The functions are equal to certain centrally reflected generalised Laguerre polynomials of degree κ , i.e. evaluated at $-x$ (Abramowitz and Stegun (1972: 775 and 781), in fact $C_\kappa(x) = L_\kappa^{(-1)}(-x)$). For example:

$$C_1(x) = x, \quad C_2(x) = x + \frac{1}{2}x^2, \dots$$

These functions vanish at the origin, as do all the increasing solutions for κ non-integral. They are accessible through Mathematica as a multiple by $(-1)^\kappa/(\kappa!)$ of HypergeometricU $[-\kappa, 0, -z]$ or as a multiple by $1/(\kappa!)$ of Hypergeometric1F1Regularized $[-\kappa, 0, -z]$.

The corresponding second solutions for $\kappa = 1$ and $\kappa = 2$ are available in the logarithmic format

$$\begin{aligned} U_1(x, \beta) &= 1 + \beta x - \frac{1}{2}x^2\left(1 - \frac{1}{6}x + \frac{1}{6}x^2 - \dots\right) + x \ln x, \\ U_2(x, \beta) &= 1 + \beta x + \frac{1}{2}(\beta - 3)x^2 - \frac{1}{6}x^3\left(1 - \frac{1}{6}x + \frac{1}{6}x^2 - \dots\right) + (x^2 + 2x) \ln x \\ &\quad + 1 + \frac{\beta}{2}(x^2 + 2x) - \frac{3}{2}x^2 - \frac{1}{6}x^3\left(1 - \frac{1}{6}x + \frac{1}{60}x^2 - \dots\right) + (x^2 + 2x) \ln x, \end{aligned}$$

where for $\kappa = 1$ the choice $\beta = .4227846$ yields $P_1(x)$, and in the case $\kappa = 2$ the choice $\beta = 1.1544314$ yields $P_2(x)$.

In general for κ an integer we have for some constant β and a standard polynomial $B_\kappa(x)$ of degree κ (details in Appendix 2) that

$$v_\kappa(x) = C_\kappa(x) \ln x + \beta \cdot B_\kappa(x) - \frac{1}{\kappa(\kappa+1)} x^{\kappa+1} \left(1 - \frac{1}{(\kappa+1)(\kappa+2)} x^2 + \dots\right).$$

The case $\kappa = \infty$ corresponding to $\alpha = i$ (where $\lambda = 0$) is relevant when the dividend rate is to be bounded above on the grounds of solvency. The solution function is given by modified Bessel functions of order one.⁹

Remark on stability. A small perturbation in the value of β will alter the behaviour of the second solution, so that it either becomes unbounded, and either positive and increasing, or ultimately negative. Restricting the embedded options to the contraction activity only lays the ACTW model open to parameter estimation instability. Allowing alternative options would rescue the model from criticism.

5. Cusp-like feature: removal by the coupon

For a general positive coupon (non-integer), the first and second solutions have finite slope at the origin. Indeed, in the case of the put-like solution this follows from the differential equation (8) directly since

$$P'(0) = -iP(0)/C = -i/C.$$

Evidently, as $C \rightarrow 0$ the slope becomes infinite.

Integral coupons may be of interest, so consider by way of example what happens when $B = -1$, i.e. $c = 1$ (meaning $C = \zeta/2$). Here for $\lambda > 0$ in the original domain, the solution is $y(2\lambda\eta)$ which for $\kappa > 1$ comes in the form

$$y(x) = \frac{\kappa(\kappa-1)}{2} \left(x^2 + \frac{\kappa-2}{3} x^3 + \dots \right) \log x \\ + 1 - \kappa x + b_2 \left(x^2 + \frac{\kappa-2}{3} x^3 + \dots \right) + \frac{\kappa(\kappa-1)}{2} \left(\frac{11+2\kappa}{9} x^3 + \dots \right)$$

and there is still no cusp-like feature at the origin. Moreover, the function is positive at the origin.

6. A snake-shaped fund and the dissipation conjecture

In seeking to explain how both book value and capitalized earnings should enter into the valuation of the firm Burgstahler (1998) formulated two conjectures to be settled by empirical investigation. One is the convex shaped graph for equity value arising from the adaptation conjecture (which exercised us in the earlier sections above). The alternative is the dissipation conjecture, which assumes that differences between capitalised earnings and book value tend to be dissipated by economic forces; this is turned into a geometric statement to the effect that the value function may be represented by an increasing snake-like graph;¹⁰ Burgstahler argues that under the dissipation argument ‘the market value falls below book value when capitalised earnings is below book value, and the market value falls above book value when capitalised earnings is above book value’.

In this section we show that the generalised model of Section 2 can also produce the snake-like shape for the value of a firm, but for rather different reasons which remain consistent with, rather than opposed to, the option-like foundation of the adaptation conjecture. Indeed, a non-smooth linearised version of the dissipation shape may be synthesised by holding long a bond plus a call, and shorting a put with a strike chosen artificially below that of the call. Our contribution is to observe that a smooth analogue of this phenomenon may be naturally (rather than artificially) recreated using the generalised model of Section 2 by using the put-like and call-like valuations associated with the embedded options of a firm.

We note in passing that one intuition for creating a ‘holding company’, or fund with such a portfolio, is an attempt to make gains from valuation mismatches arising from the application of what Abel et al. (1996) term the ‘naive investment rule’ (whereby the current unit cost of capital is regarded as identifying the marginal value of capital installed in an enterprise). They identify the true relation between the marginal value of capital already in place computed without future investment/divestment adjustments (say MV) and the

current unit cost of capital p , less the discounted marginal option values to expand or contract. In symbols the relation is that

$$MV^- = p - \frac{P}{1+i} + \frac{C}{1+i}.$$

Thus a rationally held belief (e.g. by reason of managerial inertia) that $MV^- = p$ ignores (strategic) option values available to the enterprise through its ability to contract or expand in a future period.

As for the technicalities of our construction, begin by noticing that if $c = \kappa$ in the complementary equation (9), then one solution is $W(y) = e^{-y}$ and is put-like. If $c = \kappa = m$ another solution is identified¹¹ in Appendix 2 as the polynomial

$$u_m(y) = 1 - y + \frac{y^2}{2!} + \dots + \frac{(-y)^m}{m!},$$

the partial sum to order m of the series for e^{-y} . Note that for m odd this function changes sign, so is not put-like or call-like. However, $C_m(y) = e^{-y} - u_m(y)$ is positive for m odd and negative for m even.¹² It is thus call-like for m odd¹³ and by Taylor’s Theorem behaves rather like the power function y^{m+1} . (The behaviour for m even of the negative $-C_m(y)$ is analogous, and is, in particular, call-like.)

Combining with the particular solution $\eta = y/2\lambda$ we thus have the general form of the solution to the equity value equation (7) in the scaled variable y as

$$V(y) = \frac{y}{2\lambda} + Ke^{-y} + L \left(1 - y + \frac{y^2}{2!} + \dots + \frac{(-y)^m}{m!} \right),$$

for arbitrary K and L . In the case $\kappa = 3$ we can arrange for the function $V(y)$ to exhibit a monotonically decreasing snake-like shape involving a stationary inflection got by putting $K = L = 1$ with an appropriate positive choice of λ . See Figure 1.

Of course in view of the identity $W + u = 2W - (W - u)$, the value may be construed as a financial instrument (with underlying asset – equity in the firm) whose structure involves the firm as it is (valued at η), plus a long put (on its adaptation

¹⁰ I am grateful to Jim Ohlson for alerting me to the possible occurrence of such shapes and to Mark Tippett for this reference.

¹¹ This solution may be found by the method of reduction of order. The substitution $u(y) = v(y)e^y$ leads to a first order differential equation in v' which yields u as a multiple of the integral

$$I_m = e^{-y} \int y^m e^y dy.$$

Indeed $u_m(y) = (-1)^m I_m / m!$.

¹² The partial sums of the alternating series for e^{-y} overestimate for m odd and underestimate for m even.

¹³ The function $C_m(y)$ has derivative $-C_{m-1}(y)$ so for m odd is increasing.

Figure 1
Plot of $V(y)$ when $K = L = 1$: reversion value + long put + short call

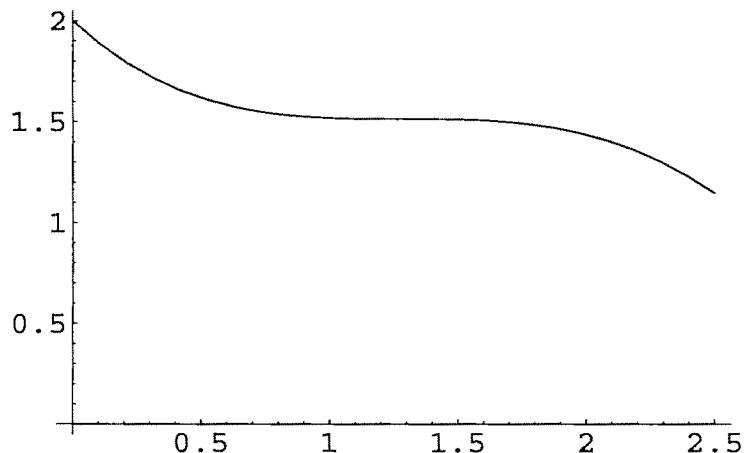
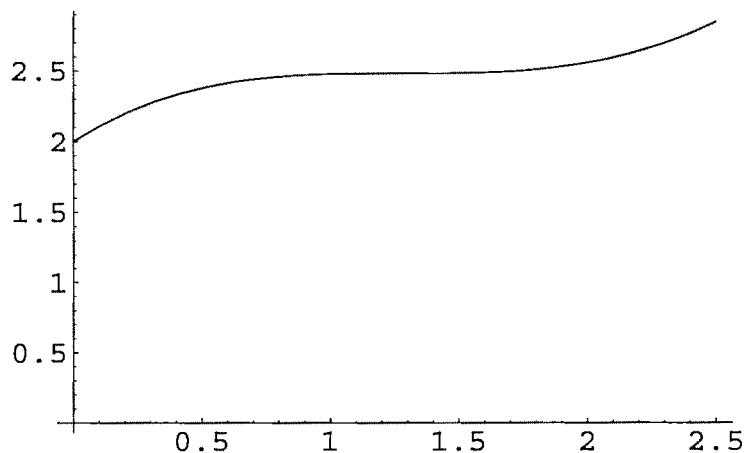


Figure 2
Plot of $4 - V(y)$ when $K = L = 1$: bond + short reversion value + short put + long call



value), plus a short call on the firm. This shape may then be transformed to a positive, monotonically increasing, snake-like shape by a shift and a sign reversal, as the value of a portfolio/fund long on a bond, short on the firm with adaptation value and long on a call on the firm (to take advantage of expansion potential in the firm). See Figure 2.

Note that to find a stationary inflexion point from $V(y)$ we need the first-order condition

$$\frac{1}{2\lambda} - Ke^{-y} - L \left(1 - y + \dots - \frac{(-y)^{m-1}}{(m-1)!} \right) = 0,$$

and the inflexion condition

$$Ke^{-y} + L \left(1 + \dots + \frac{(-y)^{m-2}}{(m-2)!} \right) = 0,$$

to hold simultaneously. In the case when $m = 3$ we have

$$\frac{K}{L} e^{-1} = (y-1) e^{(y-1)} = W^{-1}(y-1),$$

using the product-log function $W(\cdot)$. Thus the location of the stationary inflexion point is

$$y = 1 + W\left(\frac{K}{L} e^{-1}\right).$$

Choosing $K = L = 1$ yields a value $y = 1.278465$ from which we may choose a value of λ via (24) to obtain the graph shown.

7. Comparative statics: a simplified perspective

In this section a simplified function substitutes for the equity value; it is shown that the qualitative features considered by ACTW can be deduced from this simpler function.

7.1. Monotonicity in μ

Recalling that $\lambda = \mu/\kappa$ and fixing κ write the adaptation option in the form

$$P_\kappa(\eta; \mu) = \exp(-2\mu\eta/\kappa).$$

Thus for fixed η the adaptation value decreases as μ increases.

7.2. Bottoming out the 'smirk' (location of the minimum)

Using an asymptotic formula as a simplification now gives

$$V(\eta) = \eta + P_1(0)e^{-2\lambda\eta}$$

which has a minimum (bottom of the 'smirk') when

$$1 = 2\lambda P_1(0)e^{-2\lambda\eta},$$

so

$$\eta = \frac{\log 2\lambda + \log P_1(0)}{2\lambda},$$

or

$$\eta = (i - \alpha) \frac{\log 2 + \log(i - \alpha) - \log \zeta + \log P_1(0)}{2\zeta}.$$

In the examples of ACTW $2\lambda = \mu$ and $P_1(0) = 1$, so the smirk location is not available as a positive number; however with a larger dormant value, say with $P_1(0) > 1/\mu$ the smirk location reappears as a positive number.

7.3. Comparison to a non-dividend paying firm

Using the simplification as earlier, in the case of the dividend-paying firm the put-like value is taken to be

$$P_\kappa(\eta) = P(0)\exp(-2\lambda\eta),$$

whereas for the non-dividend firm one has

$$P_\kappa(\eta) = P(0)\exp(-2\mu\eta).$$

To graph the specific example when $\mu = 2\lambda$ (i.e. $\kappa = 2$), it is enough to look under a rescaling at $e^{-x} - e^{-2x}$. The latter is non-negative function which is zero at the origin and at infinity, so will possess a maximum. See Figure 2.

Evidently, since equity value is given by adding in η to both firm types, the difference in their equity values is thus proportional to

$$D(\eta) = e^{-2\lambda\eta} - e^{-2\mu\eta} > 0.$$

This has a maximum when

$$\mu e^{-2\mu\eta} = \lambda e^{-2\lambda\eta}$$

or

$$\frac{1}{1 - \alpha/i} = \kappa = \frac{\mu}{\lambda} = e^{2(\mu - \lambda)\eta} = e^{2\alpha\eta/\kappa},$$

i.e.

$$\eta = \frac{\zeta}{2\alpha} \ln \kappa = -\frac{\zeta}{2\alpha} \ln \left(1 - \frac{\alpha}{i} \right).$$

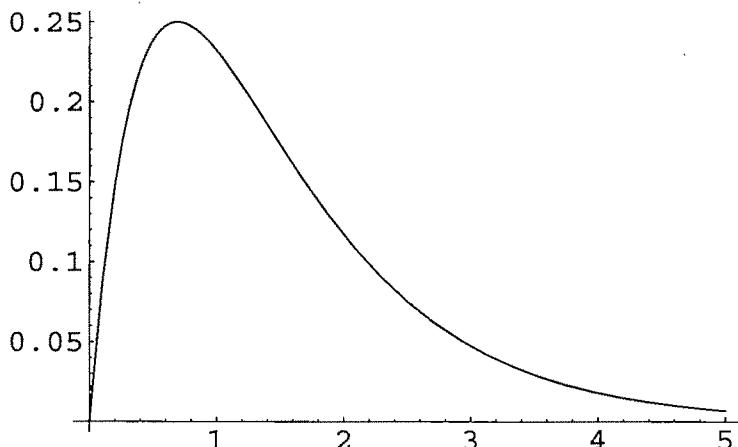
For one example considered by ACTW, in which $\zeta/\alpha = 8$ and $\alpha/i = 1/2$, this formula gives

$$\eta = 4 \log 2 = 2.77,$$

which over-estimates the peak position of 1.23. In the other example considered by ACTW, namely $\zeta/\alpha = 4$ and $\alpha/i = 1/2$ the formula gives

$$\eta = 2 \log 2 = 1.38,$$

Figure 3
Dividend ‘paying’ less ‘non-paying’ values, equivalent plot to $e^{-x} - e^{-2x}$



which over-estimates the peak position of 1.28. Thus, for smaller values of ζ/α the approximation improves.

Remark. In the presence of frictions, such as costs borne as a result of dividend payouts, it might no longer be true that the dividend-paying firm does better than its non-dividend paying counterpart. We note that the effect on equity value of the dividend payment is low when η is low and when η is large.

8. Varying dividend regimes

This section is concerned with a variation of the ACTW model in which the choice of α in the dividend rate $\alpha \cdot \eta$ is endogenised; the analysis here has limited scope and in principle one should study other classes of dividend policies not just the proportionate ones (compare Jeanblanc-Picque and Shiryaev (1995) where bounded dividend policies are discussed, and creaming-off policies in which accumulation of reserves up to a threshold can be optimal; these approaches would be appropriate in the presence of call-like options but these are ignored here). For simplicity, it is assumed below that there is a cost incurred from paying the dividend rate $\alpha(\eta)\eta$ and that the cost, which is charged against the firm simultaneously with the payout, is at a rate $C(\alpha(\eta)\eta)i$. Two justifications for this friction come to mind.

The first is a precautionary need by the firm to buy insurance against a fall in the value of η . However, firms may not wish to insure at larger values of η (in this case the costs are linear – caused by taxation losses), compare Rochet and Villeneuve (2004), and this issue is not studied here. An alternative reason is informed by the Bhattacharya (1979) model of a rationally reinvesting firm that is concerned with making up shortfalls of cash flows relative to promised dividends, for which the signalling benefit of dividends derives from the rise in liquidation value $V(D)$ caused by a *committed*, and actually paid, dividend level D . In the subsequent one-period, Bhattacharya deduces the signalling cost when the end-of-period earnings X have a general cumulative distribution $F(X)$ over a finite interval, and there is an additional constant cost rate $\gamma \geq 0$ of replacing required capital when the earnings fall below the dividend already paid out. His formula $C(D)$ for the cost of issuing D is

$$C(D) = \tau D + \gamma \int_0^D F(x) dx,$$

where τ is the income tax rate. Thus

$$C'(D) = \gamma f(D) \geq 0,$$

and in general $C(D)$ is strictly convex; for earnings that are distributed uniformly on the unit interval

this cost is¹⁴:

$$\tau D + \frac{\gamma}{2} D^2.$$

Though the distribution for η is not uniform, for illustrative purposes the example below uses the simplest convex cost function, namely Bhattacharya's quadratic signalling cost.

Treating η like a state variable governed by the state equation (15) and interpreting dD now as the net outflow, so that

$$dD(t) = \alpha \cdot \eta_i dt - C(\alpha \cdot \eta_i) idt,$$

it follows that

$$\begin{aligned} d\eta_i &= i\eta_i dt + \zeta^{1/2} \eta^{1/2} dz_i - dD \\ &= ((i - \alpha)\eta_i + C(\alpha \cdot \eta_i)i) dt + \zeta^{1/2} \eta^{1/2} dz_i. \end{aligned}$$

So supposing that $\alpha = \alpha(\eta)$ is a control variable selected to maximize

$$V(\eta) = E[\int_0^\infty e^{-rt} dD(t) | \eta_0 = \eta],$$

the Bellman equation may be written in the form:

$$\begin{aligned} V(\eta) &= \max_{\alpha} \{ \alpha \eta dt - C(\alpha \eta) idt + (1 - idt) \times \\ &\quad E[V + V' \cdot ((i - \alpha)\eta_i dt + C(\alpha \cdot \eta_i)i idt + \zeta^{1/2} \eta^{1/2} dz_i) + \frac{1}{2} \zeta \eta V'' dt] \}, \end{aligned}$$

so that

$$0 = \max_{\alpha} \{ \alpha \eta - C(\alpha \eta) i - iV + V'((i - \alpha)\eta + C(\alpha \eta)i) + \frac{1}{2} \zeta \eta V'' \}.$$

This might be maximised at a corner value for α , like $\alpha = 0$ and one might further restrict α to small η on grounds of solvency (to e.g. $0 \leq \alpha \leq i$) so that a second corner is introduced into consideration. If the optimal α arises as an internal point in the permitted range, then

$$\eta - \eta i C'(\alpha \eta) - \eta V' + i \eta C' V' = 0.$$

So provided $V'(\eta) \neq 1$, the first order condition reads:

$$C' = 1/i.$$

¹⁴ At its simplest, earnings x which at the end of one period are drawn uniformly from the unit interval have expected value 1/2. If D has been paid at the beginning of the period then assuming zero capital gains tax and an income tax rate of τ , the expected loss to the equity holders arising from taxes on D and the cost of replacing funds dropping below D is

$$\tau D + \int_0^D \gamma(D - x) dx = \tau D + \frac{\gamma}{2} D^2.$$

¹⁵ In the case of Bhattacharya's quadratic

$$\bar{c} = \bar{q} - C(\bar{q})i = i\gamma\bar{q} + i\frac{\gamma}{2}\bar{q}^2.$$

¹⁶ In this section we drop earlier notation and let $P_0, P_{\bar{q}}, P_i$ describes various put-like functions (without the subscript implying values for κ).

Thus if $C(\cdot)$ is strictly convex, and the first order condition has a solution at all, the implied optimal dividend rate $\alpha \eta$ is constant, say \bar{q} . This is a remarkable conclusion and so calls for a brief interpretative inspection.

Comparative statics for Bhattacharya's quadratic costs

If $C(x) = \gamma x^2/2 + \tau x$ is Bhattacharya's quadratic cost function, then the optimal dividend rate $\alpha \eta$ is given by

$$\alpha \eta = \bar{q} = \left(\frac{1}{i} - \tau \right) / \gamma. \quad (25)$$

This formula implies that (i) a lower tax rate on the dividend leads to a larger dividend, and this agrees with the usual tax-shelter intuition about retained earnings; (ii) higher costs associated with replacement funding (i.e. higher γ) lead to lower dividend payout; (iii) the higher the required rate of return on investment the lower is the dividend payout.

The corresponding equation for V , for a general cost function, is

$$\frac{1}{2} \zeta \eta V'' + (i\eta - [\bar{q} - C(\bar{q})i])V' - iV = C(\bar{q})i - \bar{q}.$$

As usual this has $V = \eta$ as a particular solution and the complementary equation is again a general confluent hypergeometric equation of the form

$$\frac{1}{2} \zeta \eta W'' + (i\eta - \bar{c})W' - iW = 0, \quad (26)$$

where $\bar{c} = \bar{q} - C(\bar{q})i > 0$ consistently with the sign in (9). This sign is positive since C is convex, $C(0) = 0$, and the choice $q = \bar{q}$ maximises $q - C(q)i$.¹⁵

Provided the frictions are not too large (say (22) holds), there exist monotonic solutions with qualitative behaviour the same as in the frictionless case. Assume therefore that frictions are low.

To find an instance of the optimal value function one would need to make some assumptions as to the nature of the options available to the firm. In general there is an abundance of solutions available depending on what structural assumptions one were to make about the firm.

For a qualitative illustration follow ACTW by assuming that only contraction in activity is available at any level of η . Thus only value functions that are defined by restriction from a decreasing non-negative function asymptotic to zero are considered. One must also assume that the value function has a known value when $\eta = 0$. This known value is termed the 'dormant value' by ACTW (and without loss of generality may be taken at unity).

So aiming towards a contradiction assume first that zero dividends are optimal near $\eta = 0$, and let $P_0(\eta)$ be the standardised fundamental solution¹⁶ to the 'non-dividend' equation (corresponding to $\kappa = 1$):

$$\frac{1}{2}\zeta\eta P'' + i\eta P' - iP = 0,$$

i.e., the solution subject to $P(0) = 1$ and to $P(\eta)$ being asymptotic to zero at infinity.

One may then match any multiple A_0 of $P_0(\eta)$ to the solution of (26) by requiring continuity of value and of derivative at $\eta = \bar{\eta}$. Thus if $P_{\bar{q}}(\eta)$ is the standardized fundamental solution of (26) subject to $P_{\bar{q}}(0) = 1$ one must solve for $A_{\bar{q}}$ and $\bar{\eta}$ the equations

$$\frac{1}{2}A_{\bar{q}}P_{\bar{q}}''(\bar{\eta}) = A_0P_0''(\bar{\eta}), \quad A_{\bar{q}}P_{\bar{q}}'(\bar{\eta}) = A_0P_0'(\bar{\eta}).$$

So if $\bar{\eta}$ exists it is given by equating the corresponding elasticities¹⁷ $\varepsilon_{\bar{q}}$ and ε_0 of the relevant put values, namely

$$\varepsilon_{\bar{q}} = -\frac{P_{\bar{q}}'(\bar{\eta})}{P_{\bar{q}}(\bar{\eta})} = -\frac{P_0'(\bar{\eta})}{P_0(\bar{\eta})} = \varepsilon_0.$$

These are non-zero. Substituting from the differential equations yields

$$\frac{\bar{\eta}}{(\bar{\eta} - \bar{c}/i)} \left(\frac{\zeta}{2i} \frac{P_{\bar{q}}''}{P_{\bar{q}}} - \frac{1}{\bar{\eta}} \right) = \frac{\zeta}{2i} \frac{P_0''}{P_0} - \frac{1}{\bar{\eta}}.$$

Assuming the optimal value function is smooth $A_{\bar{q}}P_{\bar{q}}''(\bar{\eta}) = A_0P_0''(\bar{\eta})$, and cancelling by the common non-zero factor, gives the following contradiction.¹⁸

$$\frac{\bar{\eta}}{(\bar{\eta} - \bar{c}/i)} = 1.$$

So turn now to a solution near the origin with an upper boundary on α of $\alpha = i$. Such a limitation on $\alpha\eta$ is the largest natural choice given (6), if one seeks at the extreme to ensure that the expected loss in value of η is to be zero, i.e. $E[d\eta]$. If there are no frictions the solution is given by a decreasing modified Bessel function (see the footnote at the end of Section 4.3 above). When Bhattacharya's quadratic cost is invoked, this case leads to the more awkward equation

$$\frac{1}{2}\zeta\eta V'' + i(\gamma^2\eta^2/2 + \alpha\eta)V' - iV = i(\gamma^2\eta^2/2 + \alpha\eta) - i\eta,$$

since $C(i\hat{\eta})i = i(\gamma^2\eta^2/2 + \alpha\eta)$. As usual, a particular solution is η . Hence the complementary equation for a put-like function P_i is

$$\frac{1}{2}\zeta\eta P_i'' + i(\gamma^2\eta^2/2 + \alpha\eta)P_i' - iP_i = 0,$$

for which all (finite) points are regular singular. It is shown below that the qualitative properties of this equation are the same as the confluent hypergeometric equation. In fact, for η small enough, the friction parameter γ has negligible effect, as the equation may be approximated by

$$\frac{1}{2}\zeta\eta V'' + \alpha^2\eta V' - iV = 0,$$

or, using the notation in (19) of Section 4.1

$$\eta V'' + 2\lambda\alpha\eta V' - 2\mu V = 0.$$

Here λ is being discounted down by the factor $i\tau$. Judging by the intuition of section 7.3 with λ replaced by $\lambda\alpha i$, it is optimal to choose $\alpha = i$ over $\alpha = 0$, so this explains the earlier failure of smooth pasting P_0 and $P_{\bar{q}}$.

Now one can fit a scaled fundamental declining solution $P_i(\eta)$ of (27) using value matching and smooth pasting at an unknown point $\hat{\eta}$. Thus one is led to solve

$$A_iP_i(\hat{\eta}) = A_{\bar{q}}P_{\bar{q}}(\hat{\eta}), \quad A_iP_i'(\hat{\eta}) = A_{\bar{q}}P_{\bar{q}}'(\hat{\eta}).$$

Here again the value of $\hat{\eta}$ is given by equating elasticities:

$$\varepsilon_{\bar{q}} = -\frac{P_{\bar{q}}'(\hat{\eta})}{P_{\bar{q}}(\hat{\eta})} = -\frac{P_i'(\hat{\eta})}{P_i(\hat{\eta})} = \varepsilon_i.$$

Substituting from the differential equation leads to

$$\frac{i\hat{\eta}}{(i\hat{\eta} - \bar{c})} \left(\frac{\zeta}{2i} \frac{P_{\bar{q}}''}{P_{\bar{q}}} - \frac{1}{\hat{\eta}} \right) = \frac{\hat{\eta}}{C(i\hat{\eta})} \left(\frac{\zeta}{2i} \frac{P_i''}{P_i} - \frac{1}{\hat{\eta}} \right).$$

The usual continuity assumptions justify cancellation of a non-zero common factor to give

$$\frac{i\hat{\eta}}{(i\hat{\eta} - \bar{c})} = \frac{\hat{\eta}}{C(i\hat{\eta})},$$

i.e.

$$\bar{c} = i\hat{\eta} - C(i\hat{\eta})i.$$

But, by strict convexity, the maximum \bar{c} of C is unique, so that

$$i\hat{\eta} = \bar{q}.$$

Thus $\eta = \hat{\eta}$ is given by (25), and therefore the location is subject to the same comparative statics results as were earlier indicated for the dividend. Furthermore the optimal policy switches continuously from $\alpha(\eta) = \bar{q}/\eta$ to $\alpha = i$. Despite the switch in dividend policy the overall qualitative behaviour of the value function at $\eta = \hat{\eta}$ is unaltered. But it is the case that pasting of two functions occurs.¹⁹

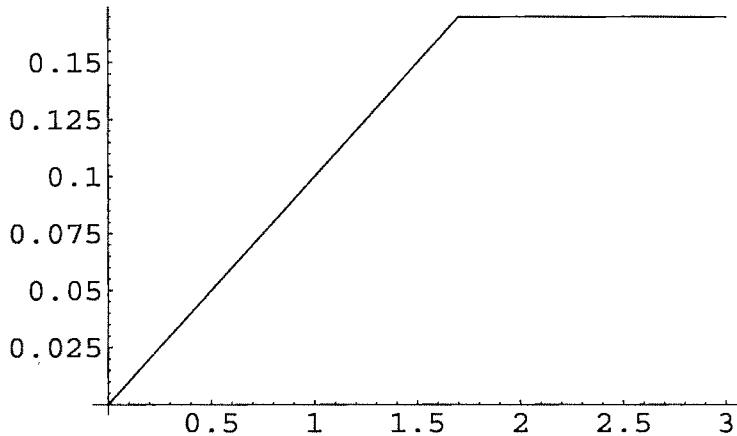
¹⁷ For an insight into the equation, observe that in the geometric Brownian case with $P(\eta) = \eta^{-k}$ the elasticity $-P'/P$ is k/η .

¹⁸ Assuming that $\eta > \bar{c}/i$ (i.e. the liquidation of assets services the perpetual bond \bar{c}) it is the case that $\eta/(\eta - \bar{c}/i) > 1$, so if at a point of intersection of the two put-like functions the curvatures are nearly identical, it follows that $\varepsilon_{\bar{q}} > \varepsilon_0$.

¹⁹ For $\eta > \bar{c}/i$ (and note that $\hat{\eta} = \bar{q}$ implies $\eta > c/i$, since $\bar{q} > \bar{c}$), on heuristic grounds, supposing that the curvature is much the same for each of the two put-like curves, one expects the relation $\varepsilon_{\bar{q}} \geq \varepsilon_i$ to hold by virtue of

$$\bar{c} \geq i\eta - iC(i\eta).$$

Figure 4
Ramp function representing the dividend rate $\alpha\eta$ under 'Bhattacharya' cost



The resulting ramped graph of the dividend rate $\alpha\eta$ in the case of the Bhattacharya cost function is given²⁰ in Figure 4; the flat level moves up as $\hat{\eta}$ increases.

Turning now to a consideration of equation (27), observe that it is of the format

$$yW'' + y(Ay + B)W' - \mu W = 0,$$

with $y = i\eta$ and $A, \mu > 0$. The transformation $W = w\exp(-\frac{A}{4}y^2 - \frac{B}{2}y)$ leads to the normalised form

$$w'' = J(y)w,$$

where

$$J(y) = \frac{\mu}{y} + \frac{1}{4}(Ay + B)^2 + \frac{A}{2} > 0,$$

and so $w(y)$ is convex for $y > 0$. The argument from section 4.2 applies here also. Thus there are two

non-negative, independent solutions with asymptotic behaviour

$$w = y^{-1/2} \exp(\pm \frac{A}{4}y^2).$$

Here we are applying the asymptotic formula (for y large) that:

$$w = J^{-1/4}(y) \exp\left(\pm \int^y J^{1/2}(z) dz\right),$$

see O'Neill (1991) or Bender and Orszag (1999). The Frobenius approach gives an indicial equation $c(c-1) = 0$ and shows one solution to be a series $w_1 = y + \dots$ and the other $w_2 = w_1 \log y + \sum_{n=0}^{\infty} b_n y^n$. (See Appendix 4.) In this respect the solutions are thus qualitatively similar to those of the confluent hypergeometric equation with zero-coupon.

9. Conclusion

By reference to various generalisations of the ACTW paradigm it is shown that their simplified paradigm is justifiable, as a route to a valuable insight into the equity value of a firm.

The approach of the current paper offers a perspective on the behaviour of equity value at small and at large values of the aggregating variable. It allows the removal of an unrealistic cusp-like feature (vertical tangency of the curve at the origin) by introducing frictions. These frictions are also

²⁰ In keeping with the notation at the start of this section whereby the cost measure is $C(.i)$, all rates are measured as multiples of i ; in the illustration with a notional average required rate of $i = 10\%$, $i\eta$ is then taken at 4 (computed as the expected present value of a constant debt-service payment discounted by a notional risk-free, as being of the order of 16% to 4%), and 0.32 is taken for $i\tau$. (This is about 8/9 of the top tax-rate of 40%.) This gives the maximum dividend rate notionaly at $\bar{\eta} = 0.17$ occurring when η is at or above 1.7. Of course this is a stylised illustration.

capable of rescuing the ACTW model from the criticism that their particular brand of put-like option is a potential source of instability, were the model to lead to parameter estimation studies. The current approach simplifies the analysis of comparative statics obtained by ACTW from numerical evidence by offering qualitative arguments.

The discussion above argues the case for the inclusion of alternative options, including expansion as well as contraction options, calling for a classification of optimally managed firm types according to their embedded options, and by implication also calls for the construction of switching models that would exhibit all the qualitative patterns predicted by the smooth pasting of various confluent hypergeometric functions which solve the general

valuation equation (including the snake example of Section 6). A preliminary analysis is offered of an endogenised selection of optimal dividend policy.

No attempt was made here to search for new insights on such traditional questions as: solvency (bankruptcy constraints in the face of debt service), debt versus equity issuance (along the lines of Leland (1994) where the firm's embedded options would be expected to play some part in altering the optimal debt capacity), or of strategic aspects of dividend issue (compare the example of the Sealed Air Corporation's one-off exhaustive dividend issue as a commitment tool – an interesting test case to try to accommodate in a theoretical development of dividend policy, see Wruck (1994)).

Appendix 1: Proof of Proposition 1

We use time labels 0 and 1 (the former for time $t = 0$, the latter for time $t = \Delta t$); recall from (5) that assuming $\lim_{t \rightarrow \infty} e^{-it} b_t = 0$ we have

$$\eta_0 = b_0 + E[\int_0^{\infty} e^{-is}(a + \varepsilon)dt].$$

Hence

$$\eta_0 = b_0 + A_0 + E_0 = b_0 + E[\int_0^{\infty} e^{-is}adt + \int_0^{\infty} e^{-is}\varepsilon dt],$$

$$\eta_1 = b_1 + A_1 + E_1 = b_1 + E_{\Delta t}[\int_{\Delta t}^{\infty} e^{-is}da(t) + \int_{\Delta t}^{\infty} e^{-is}d\varepsilon(t)],$$

where $A = A(a)$ and $E = E(\varepsilon)$ denote the expected present values of future abnormal earnings and future adjustments given the information a etc, so that $A_0 = A(a_0)$ and so on.

To first order we thus have

$$\begin{aligned} & \eta_0 - b_0 \\ &= E[\Delta A + \Delta E + (1 - i\Delta t) \int_0^{\infty} e^{-is}a'(s)ds + (1 - i\Delta t) \int_0^{\infty} e^{-is}\varepsilon'(s)ds] \\ &= E[\Delta A + \Delta E + (1 - i\Delta t)(A_1 + E_1)], \\ &= a_0 \Delta t + \varepsilon_0 \Delta t + E[(1 - i\Delta t)(A_1 + E_1)]. \end{aligned}$$

Here $t = s - \Delta t$ and so $e^{-it} = e^{-is}(1 - i\Delta t)$ to first order; $a'(s) = a(s + \Delta t)$ etc, describe the shifted abnormal earnings process starting at $a_1 = a(\Delta t)$, so that $A_1 = A(a_1)$ etc. Subtracting the first two equations gives (to first order), assuming a and ε are continuous processes, that

$$\begin{aligned} E[\Delta \eta] &= E[\eta_1] - \eta_0 \\ &= E[\Delta b - a_0 \Delta t - \varepsilon_0 \Delta t + i\Delta t(A_0 + E_0 - \Delta A - \Delta E)] \\ &= E[(ib_0 + a_0 + \varepsilon_0)\Delta t - \Delta D - a_0 \Delta t - \varepsilon_0 \Delta t + i\Delta t(A_0 + E_0)] \\ &= E[i(b_0 + A_0 + E_0)\Delta t - \Delta D] \\ &= i\eta_0 \Delta t - \Delta D. \end{aligned}$$

Appendix 2: Confluent hypergeometric functions

Recall the generalised Merton valuation equation (9)

$$y \frac{d^2W}{dy^2} + (y - c) \frac{dW}{dy} - \kappa W = 0.$$

The standard form of the confluent hypergeometric equation for $w(x)$, as given by (10), is

$$x \frac{d^2w}{dx^2} + (B - x) \frac{dw}{dx} - Aw = 0.$$

This is obtainable from (9) by setting $x = -y$ and $A = -\kappa, B = -c$. The difficulty with writing $W(y) = w(-y)$ and applying standard solutions is that $w(-x)$ is liable to be undefined for $x > 0$ on account of a branch cut (in the complex domain) for the logarithm function. It is therefore necessary to re-compute the series solutions appropriate to the equation

$$y \frac{d^2w}{dy^2} + (y + B) \frac{dw}{dy} + Ay = 0,$$

for $y > 0$. A summary of results follows. The notation adopted above is to help the reader compare formulas here against those in Slater (1960).

A2.1. Summary of some useful results

We have the following solution formats (m is a positive integer).

0. $A = B = -m$

$$K \left(1 - y + \frac{y^2}{2!} - \dots + \frac{(-1)^m}{m!} y^m \right) + L e^{-y}.$$

Note that the first function is obtainable by the method of reduction of order; see the footnote ahead of equation (23).

1. Provided $B \notin \{0, -1, -2, \dots\}$ Kummer's function is

$$M(A, B, -y) = 1 - \frac{A}{B} y + \frac{1}{2} \frac{A(A+1)}{B(B+1)} y^2 + \dots$$

2. Provided $B \notin \{1, 2, \dots\}$ a solution is given by

$$(-y)^{1-B} M(A - B + 1, 2 - B, -y).$$

For $B = 0$ this includes polynomial solutions with a root at the origin when A is a negative integer.

3. For $B = -m$ and $A \notin \{0, -1, \dots, -m\}$ there is a regularized solution given by

$$\overline{M}(A, B, -y) = (m+1)! a_{m+1} \left(\frac{y^{m+1}}{(m+1)!} - \frac{(A+m+1)}{(m+2)!(l)} y^{m+2} + \dots \right).$$

where $a_{m+1} = \alpha_{1-B}$ is defined below.

4. For $B = -m < 0$ and $A = -k$ with $k < m$ and $A \uparrow B$ (thus $A \neq B$) we have the polynomial solution

$$a_0 \left(1 - \frac{A}{B} y + \dots + \frac{(A)...(-2)(-1)}{k!(B)...(B+k-1)} y^k \right).$$

with a_0 is arbitrary.

5. For $B = -m$ and $A \notin \{0, -1, \dots, -m\}$ a solution is provided by

$$\begin{aligned} \overline{M}(A, B, -y) \log |y| + (1 - \frac{A}{B} y + \dots + \frac{A(A+1)...(A+m-1)}{m!B(B+1)...(B+m-1)} y^m) \\ + b_{m+1} (y^{m+1} - \frac{(A+m+1)}{m+2} y^{m+2} \dots) + \frac{a_{1-B}}{(2-B)} [u_{m+2} y^{m+2} + \dots], \end{aligned}$$

where

$$a_{1-B} = \frac{(A)_{1-B}}{(B)_{-B} (1-B)!}$$

Appendix 2: Confluent hypergeometric functions (*continued*)

and $(A)_m = (A + 1)\dots(A + m - 1)$ is the Pochhammer symbol, and the constant b_{m+1} is selected so that this solution is asymptotic to zero for large x . The coefficients u_{m+2} arise in computations from the following recursion starting at $n = m + 1 = 1 - B$.

$$(2n + 1) a_n + (B - 1) a_{n+1} + (n + 1)(n + B) b_{n+1} + (n + A) b_n = 0.$$

When $m = 0$ and $A = -\kappa$ this is interpreted as saying that

$$\bar{M}(-\kappa, 0, -y) \log |y| + 1 + b_1(y + \frac{(\kappa-1)}{2} y^2 + \dots) + \frac{a_1}{2} [u_2 y^2 + \dots].$$

See also Slater (1960: 8) formula (1.5.18).

Appendix 3: The case $\lambda = 0$

The case when $\alpha = i$ corresponds to the limiting case $\kappa = \infty$, or more properly to the parameter value $\lambda = 0$. This case is also of significant interest – see section 8 above. To characterise the non-negative equity value functions, we look to the differential equation (20), which now reads

$$\eta \frac{d^2W}{d\eta^2} = 2\mu W.$$

This may be recast more simply: putting $y = 2\mu\eta$ with say $R(y) = R(2\mu\eta) = W(\eta)$ one obtains

$$yR'' = R,$$

a Schrödinger equation of order 2. It is well-known (see Bender and Orszag (1999:88) that the asymptotics for large y are given, as one might expect, by

$$R(y) \sim Cy^{-1/4} \exp(\pm y^{1/2}).$$

The series solution for the increasing solution is

$$R(y) = y + \frac{y^2}{2} + \frac{y^3}{12} + \dots + \frac{y^n}{n!(n-1)!} + \dots .$$

It is of course given by the modified Bessel functions of order one:

$$\frac{\sqrt{x}}{2} I_{\pm i}(\frac{\sqrt{x}}{2}),$$

or

$$\frac{\sqrt{x}}{2} K_i(\frac{\sqrt{x}}{2}).$$

Appendix 4: Solution of a related differential equation

We consider the following equation which arises in Section 8.

$$\eta V'' + \frac{i}{\zeta} i\eta(\gamma i\eta + 2\tau)V' - \frac{2i}{\zeta} V = 0.$$

Putting $y = i\eta$

$$i\eta \frac{V''}{i^2} + \frac{i}{\zeta} i\eta(\gamma i\eta + 2\tau) \frac{V'}{i} - \frac{2}{\zeta} V = 0,$$

and with $W(y) = W(i\eta) = V(\eta)$ we write this in the form

$$yW'' + \frac{i}{\zeta} y(\gamma y + 2\tau)W' - \frac{2}{\zeta} W = 0.$$

since $dV/d\eta = i dW/dy$. We therefore study the form

$$yW'' + y(Ay + B)W' - \mu W = 0.$$

Here we employ the temporary notation $\mu = 2/\zeta$. We put

$$W = \sum_{n=0}^{\infty} a_n x^{n+c},$$

yielding

$$0 = \sum_{n=0}^{\infty} (n+c)(n+c-1)a_n x^{n+c-1} + A \sum_{n=0}^{\infty} (n+c)a_n x^{n+1+c} \\ + B \sum_{n=0}^{\infty} (n+c)a_n x^{n+c} - \mu \sum_{n=0}^{\infty} a_n x^{n+c}.$$

The indicial equation (from the coefficient at the lowest power x^{c-1}) is

$$c(c-1) = 0.$$

The next power is x^c and yields the equation

$$c(c+1)a_1 = (\mu - Bc)a_0.$$

Opting for the larger root $c = 1$ gives

$$\sum_{n=0}^{\infty} (n+1)na_n x^n + A \sum_{n=0}^{\infty} (n+1)a_n x^{n+2} + B \sum_{n=0}^{\infty} (n+1)a_n x^{n+1} - \mu \sum_{n=0}^{\infty} a_n x^{n+1} = 0.$$

Consideration of the coefficient at x^{n+1} yields

$$a_{n+1}(n+2)(n+1) - A n a_{n-1} + B(n+1)a_n - \mu a_n = 0,$$

so

$$a_{n+1}(n+2)(n+1) = (\mu - B(n+1))a_n + A n a_{n-1},$$

with

$$a_1 = \frac{\mu - B}{2} a_0.$$

Hence the series has infinite radius of convergence. Note that

$$6a_2 = Aa_0 - (2B - \mu)a_1 = Aa_0 + (\mu - B)(\mu - 2B)a_0.$$

The Frobenius theory implies that in this case the second solution is logarithmic and of form

$$k(x + \dots) \log x + \sum_{n=0}^{\infty} b_n x^n,$$

exhibiting a cusp-like feature at the origin. See O'Neil, 1991: 326.

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Implied cost of equity capital in earnings-based valuation: international evidence*

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Abstract—Assuming the clean surplus relation, the Edwards-Bell-Ohlson residual income valuation (RIV) model expresses market value of equity as the sum of the book value of equity and the expected discounted future residual incomes. Without assuming the clean surplus relation, Ohlson and Juettner-Nauroth (2000) articulate the role of forward earnings per share in valuation. We compare the implied costs of equity capital from these two approaches to earnings-based valuation within seven developed countries. We hypothesise superior performance from the RIV model in countries where the clean surplus relation holds well. First, we provide preliminary international evidence on the frequency and magnitude of the clean surplus deviations. Consistent with our hypothesis, we document superior reliability of the implied cost of equity capital derived from the RIV model when clean surplus adequately describes the firms' financial reporting. That is, the implied cost of equity capital derived from Ohlson and Juettner-Nauroth (2000) is relatively more reliable in countries where the clean surplus deviations are common. Our analyses suggest that the proper choice of earnings-based valuation model may depend on analysts' interpretation of their financial reporting environment.

1. Introduction

As is now well understood, the Edwards-Bell-Ohlson residual income valuation model (hereinafter RIV model) requires the clean surplus relation to rewrite the dividend discount model. In this paper, we provide evidence of how the assumption of the clean surplus relation applies to accounting data for firms in different countries. We proceed to investigate whether the relative performance of the RIV model varies internationally with the significance of potential clean surplus deviations within each country. We predict that in reporting environments where clean surplus relation deviations abound, the RIV model is less likely to succeed. As a benchmark for our analysis, we consider the Ohlson and Juettner-Nauroth model (hereinafter OJ model) which does *not* assume that clean surplus relation holds. We examine the relative reliability of the implied costs of equity from two earnings-based approaches, the RIV valuation model and the OJ model, within a sample of seven developed countries.

That most prior empirical analyses use data from US stock markets might raise methodological concerns. The capital markets around the world are, from the perspective of investors and analysts, ei-

ther integrated or segmented. Suppose initially that capital markets are largely integrated on a global scale. First, although the capital markets are integrated on a global scale, investors and analysts in different countries likely apply different heuristics to generate earnings forecasts and to value firms. For example, the use of PEG ratios, which are a special case of the OJ model, is documented in the US starting in the early 1990s, but its use has not been documented internationally.¹ The representativeness of any single valuation model, such as PEG ratios, and the variation in investors'/analysts' choice of valuation methods might differ between stock markets and countries. Second, since the US economy has been growing consistently over a prolonged period of time, the inferred growth rates might be overstated relative to the average growth rate of the world. Alternatively, suppose that capital markets are segmented and that investors' portfolio choices exhibit home bias. In both cases, the inferences drawn from the US data might not generalise to other countries.

First, we provide evidence on the clean surplus relation in international accounting data. While accounting standard setters in many countries have pursued the reporting of the comprehensive income, the clean surplus relation need not be a descriptive assumption in financial reporting environments where the accounting standards

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¹ See Bradshaw (2002, 2004) and Demirakos et al. (2003). We performed an unstructured search on the Internet and found examples of PEG ratios in France (Paris-based analyst Arnaud Joly on Mr Bricolage SA in 2002), Germany (MediClin) and the UK (Phillip Securities Limited on Barclays plc).

allow or require material deviations from the clean surplus relation. While differences in accounting methods remain across firms within any single country, this variation is likely more pronounced globally. Thus, the clean surplus relation may not be an equally effective assumption in all countries. To investigate this possibility, we proceeded to analyse the ex post deviations from the clean surplus relation in different countries. Following Lo and Lys (2001), we provide evidence on the magnitude of deviations from the clean surplus relation in percentage of the ending book value of equity. Such deviations from the clean surplus relation in prior years could, if correlated with analyst forecasts deviations from clean surplus, impact the precision of our estimated costs of capital.²

Second, producing a reliable empirical representation of firms' expected cost of equity is, of course, a fundamental accounting research question in its own right. Early research documents that ex post realised stock return is a natural, but noisy and potentially biased, proxy of the expected cost of equity (Elton, 1999). For example, Gebhardt et al. (2001) analyse the expected cost of equity implied in the equation between stock prices and intrinsic value estimates based on analyst earnings forecasts. In this paper, we explore what type of earnings-based valuation models, RIV or OJ, should be preferred in different countries.

Although earnings-based valuation models derive from a common underlying theory, the dividend discount model, their empirical implementation may cause differences in their assessed validity. When the empirical implementation involves simplifying assumptions about dividend payout ratios or terminal value calculations, the reliability of the implied cost of equity may vary. Therefore, identifying the preferred valuation model for deriving a reliable implied cost of equity capital is an empirical question. However, given the plethora of possible implementations, this question is difficult to resolve exhaustively. We address this concern by applying the representative implementations of alternative valuation models to different environments.

We extend prior studies of the implied cost of equity to an international setting, examining the reliability of the implied costs of equity in various environments of different countries. Diverse accounting standards and economic situations across different countries offer an empirical setting in which we can examine the robustness of the rela-

tive reliability of alternative estimates of implied costs of equity. For example, if a specific assumption about terminal values is descriptive of the underlying economic reality, the resulting implied cost of equity can approximate the true, unobservable cost of equity. Since different countries are under different economic and regulatory conditions, our international study facilitates more robust inferences about the relative reliability of the implied cost of equity. We consider the implied costs of equity derived from the representative earnings-based valuation models, such as the OJ model, the PEG model, and two different implementations of RIV models, within Australia, Canada, France, Germany, Japan, the UK and the US.³ In particular, cross-country variation in dirty surplus accounting should affect the RIV model, but not the OJ model.⁴ As already argued, the OJ model avoids the assumption of the clean surplus relation, while the RIV model requires it. This difference motivates testing the relative reliability of the implied cost of equity based on the OJ model versus the RIV model.

We examine which implied cost of equity is more closely associated with the representative risk proxies within each country and then compare the relative ranks of implied cost of equity across countries. Specifically, our metric of the reliability of the implied cost of equity is the adjusted R^2 of the regression of implied cost of equity on common risk proxies.

In terms of the association with risk proxies, we find that the RIV model reflecting industry-specific information is superior to, or equivalent with, alternative implementation of the RIV model that only reflects firm-specific information. That is, industry-specific information is incrementally helpful for enhancing the implied costs of equity for our countries. Further, the OJ model appears inferior to, or equivalent with, the PEG model (a simpler version of the OJ model), in all countries. Finally, we find that the RIV model clearly dominates the OJ model in countries where the clean surplus relation tends to hold (Australia, Canada, Japan and US) but not in the (European) countries with more pronounced dirty surplus. Overall, the clean surplus relation affects the relative performance of the RIV model as we predict.

Our study makes several contributions to the existing literature. We evaluate different measures of the implied costs of equity based on the RIV model and the OJ model in an international setting. Although prior research examines the relative reliability of alternative implied costs of equity using the US data, it remains unresolved whether these results generalise to other countries. By exploiting the diversity of economic conditions and accounting rules across seven countries, we offer more robust conclusions regarding the relative reliability

² The implied cost of equity capital resulting from the implementation of RIV models *without* a terminal value assumption should be unaffected by ex post deviations from clean surplus. See formal proof in the Appendix.

³ These seven countries were chosen because they cover a substantial proportion of the world's total stock market capitalisation with data available.

⁴ This is in the spirit of Walker (1997:352).

of implied costs of equity. Second, the increasing globalisation of financial markets motivates investors' and analysts' interest in which valuation model is preferred for determining the implied costs of equity capital. Third, the fact that the potential deviations from the clean surplus relation affects the relative validity of accounting-based valuation models might inspire accounting standard setters in different countries as they decide whether to pursue the reporting of the comprehensive income.

The paper proceeds as follows. Section 2 reviews the related literature. Sections 3 and 4 describe the variable measurements and our sample. We present our empirical evidence in Section 5 and summarise in Section 6.

2. Literature review

Our research relates to the intersection between the implied cost of equity and international valuation. This section briefly outlines the literatures in these areas.

2.1. Prior literature on implied cost of equity

Research in accounting and finance explored the *ex ante* cost of equity which is required as input for tests of asset pricing models and accounting-based valuation models. Since the *ex ante* cost of equity is unobservable, *ex post* realised stock returns are an often-used proxy. The *ex post* return has proven a notoriously noisy proxy for the *ex ante* cost of equity (for example, see Fama and French, 1997).

Gebhardt et al. (2001) present an alternative approach to estimating the *ex ante* cost of equity by calculating the internal rate of return that equates the stock prices with the intrinsic value estimates based on analyst earnings forecasts. They calculate the implied cost of equity from the RIV model using analyst earnings forecasts as proxies of the market's earnings expectations. Gebhardt et al. (2001) proceed to examine the relation between these implied costs of equity and *ex ante* firm characteristics previously suggested as risk proxies. They conclude that the implied cost of equity correlates systematically with several risk proxies, suggesting the reasonableness of their alternative approach to estimate the *ex ante* cost of capital.

Subsequent papers examine the reliability of the alternative implied costs of equity. For example, Botosan and Plumlee (2002) assess which valuation model produces the implied cost of equity approximating the *ex ante* cost of equity. They conclude that the implied cost of equity derived from the PEG model associates consistently with all of the considered risk proxies. In contrast, the associations between the implied cost of equity based on the RIV model or the OJ model and their risk proxies are unstable. Similarly, Easton and Monahan (2003) provide evidence that the reliabil-

ity of the implied costs of equity derived from naïve heuristics (such as price-to-forward earnings multiple) compares to those derived from theoretical models, such as the RIV model or the OJ model. However, Gode and Mohanram (2003) report, among others, that within the US the RIV model reflecting industry-specific information outperforms the OJ model in terms of the correlations with risk proxies. Guay et al. (2003) conclude that only the implied cost of equity derived from the RIV model reflecting industry-specific information exhibits a significant correlation with two-year and three-year-ahead stock returns.

In summary, although prior research examines the reliability of implied costs of equity derived from a variety of valuation models in terms of the association with frequently cited risk proxies or realised stock returns, their analysis is generally limited to US firms. Further, their conclusions regarding the relative reliability of implied costs of equity remain mixed.

2.2. Prior literature on international valuation

Despite the popularity of the RIV model, little research explores the performance of the RIV model, or the OJ model, in an international setting. Frankel and Lee (1999) conclude that firm value estimates derived from the RIV model better explain the cross-sectional distribution of the stock prices in 20 countries than earnings or book value. They report that, in most countries, the intrinsic value estimates based on the RIV model account for more than 70% of the cross-sectional variation of stock prices. Their results predict that the implied cost of equity derived from the RIV model might be reliable within their sample countries. Hail and Leuz (2003) also explore the properties of the implied cost of equity in an international setting. They focus on the effects of a specific country legal environment on the 'level' of the cost of equity, but do not focus on the performance of alternative valuation models for the implied cost of equity.

Of particular interest for this study, Frankel and Lee (1999) point to the possibility that systematic deviations from the clean surplus relation are a source of noise in the intrinsic value estimates based on analyst earnings forecasts. This would imply that the country-specific extent of the clean surplus relation deviations might affect the relative reliability of the implied costs of equity derived from the RIV model or from the OJ model across countries. Given the limited evidence on the relative validity of different earnings-based valuation models across countries, we provide initial evidence on cross-country variation in the degree of clean surplus deviations, which will affect the relative validity of different earnings-based valuation models.

3. Research design and variable measurement

This section describes how we compare the reliability of different implied costs of equity, the assumptions we apply to different valuation models to derive the implied costs of equity, and which variables are chosen as the representative risk proxies.

3.1. Measurement of the reliability of implied cost of equity

Since the true ex ante cost of equity is unobservable, a direct assessment of the reliability of implied cost of equity is impossible. As an indirect assessment we examine the relation between the implied cost of equity and the risk proxies that are commonly believed to affect the cost of equity. We base our empirical specification of risk premia in the capital markets on the Arbitrage Pricing Theorem (APT). Ross (1976) derives firm i 's expected cost of equity ($E[r_i]$) as a function of the risk free rate (r_f) and the excess expected return associated with K risk factors. This leads to the following equation for the expected cost of equity:

$$E[r_i] = r_f + \sum_{k=1}^K \lambda_k (E[r_k] - r_f) \quad (1)$$

While the APT does not identify the risk factors, prior research identifies the risk proxies, described below, which we use in this study.

Based on equation (1), we examine which implied costs of equity are more highly associated with our risk proxies in cross-section within each country.⁵ If a specific implied cost of equity is more reliable than others, this estimate should exhibit a stronger association with risk proxies. Therefore, we use the adjusted R^2 of the regression of implied cost of equity on frequently cited risk proxies as the main metric of the reliability of the implied cost of equity.⁶

⁵ This methodology is consistent with Gebhardt et al. (2001), Botosan and Plumlee (2002) and Gode and Mohanram (2003).

⁶ The discussion in Chang (1998) and Gu (2001), among others, of the use and interpretation of R^2 applies less forcefully because we compare regressions using the same firms and the same independent variables within each country.

⁷ Since analyst forecasts of five-year earnings growth are unavailable for many foreign firms, we use only one- and two-year-ahead earnings forecasts under a specific assumption about the longer period ahead earnings. In this study, this implementation is sensible since our implementation of the OJ model use only one- and two-year-ahead analyst earnings forecasts and so the comparison between the OJ model and the RIV model is unaffected by the different usage of analyst earnings forecasts for different horizons. Frankel and Lee (1999) also use only one- and two-year-ahead analyst earnings forecasts in their international valuation study. Furthermore, Lo and Lys (2001) indicate that to reflect long-term analyst earnings forecasts into the RIV model does not significantly improve its pricing performance.

3.2. Alternative measures of implied cost of equity

We derive the implied cost of equity using the OJ model and the PEG model (a specific form of the OJ model) as well as two implementations of the RIV model. We compute the implied cost of equity for each firm as the internal rate of return that equates the stock prices to intrinsic value estimates based on one-year-ahead and two-year-ahead analyst earnings forecasts.⁷ The four methods compared here all derive from the same underlying valuation model, i.e., the dividend discount model:

$$P_t = E_t \left[\sum_{n=1}^{\infty} \frac{d_{t+n}}{(1+r_t)^n} \right] \quad (2)$$

where P_t is the stock price at period t , d_t are the dividends net of capital contributions during period t , and r_t is the firm's cost of equity.

However, the RIV model specifies the valuation using the 'return on equity' rather than the level of 'abnormal earnings' as in the OJ model. Furthermore, the implementations of valuation models differ in their assumptions about the forecasts horizon and the earnings growth after the forecast horizon. For example, the OJ model uses economy-wide assumptions for the terminal earnings growth, while an implementation of the RIV model incorporates industry-specific assumptions for the terminal earnings growth. These differences in implementation might affect the reliability of the implied cost of equity. The remaining part of this section describes the salient features and key assumptions underlying these four implementations.

3.2.1. The residual income valuation model

The RIV model applies the clean surplus relation to dividend discount model and expresses prices as the reported book value of equity and an infinite sum of the discounted future residual incomes, see Ohlson (1995). However, the empirical implementation of the RIV model requires additional assumptions about forecast horizon, terminal value calculation, dividend payout ratios as well as the explicit forecasts of future return on equity (ROE) before forecast horizon. We forecast future ROE explicitly for the next two years using analyst earning forecasts, and then forecast ROE beyond year $t+2$ implicitly by adopting different terminal value calculations used in prior representative studies using the RIV model.

Following prior research, we estimate the implied cost of equity from two implementations of the RIV model. The two implementations differ only in their assumptions about the forecasts horizon and the growth of residual income beyond the forecasts horizon. Following Frankel and Lee (1998), Lee et al. (1999), Liu et al. (2002), and Ali

et al. (2003), our first RIV model assumes that the residual income is constant beyond year $t+2$. We refer to this as the RIVC model. Formally, we denote earnings per share by eps_t , and book value of equity per share by bv_t , and represent current period t price per share as:

$$P_t = bv_t + \sum_{s=1}^2 \left(\frac{E_s (eps_{t+s} - r_t \times bv_{t+s-1})}{(1+r_t)^s} \right) \quad (3)$$

$$+ \frac{E_2 (eps_{t+2} - r_t \times bv_{t+1})}{r_t \times (1+r_t)^2}$$

Our second RIV model (RIVI) assumes that the ROE trends linearly to the industry median ROE by the 12th year and that thereafter the residual incomes remain constant in perpetuity.⁸ The industry median ROE is calculated by the moving median of the previous five years' ROE of the firms within the same industry.⁹ Following Gebhardt et al. (2001), we only use firms with positive ROE in the calculation. In the RIVI model, current price per share is therefore:

$$P_t = bv_t + \sum_{s=1}^2 \left(\frac{E_s (eps_{t+s} - r_t \times bv_{t+s-1})}{(1+r_t)^s} \right) \quad (4)$$

$$+ \sum_{s=3}^{11} \frac{E_s [(ROE_{t+s} - r_t) \times bv_{t+s-1}]}{(1+r_t)^s}$$

$$+ \frac{E_{12} [(ROE_{t+12} - r_t) \times bv_{t+11}]}{r_t \times (1+r_t)^{11}}$$

where ROE_t is the return on equity during period t .

As stated previously, the RIVI model reflects the industry-specific information into terminal value calculation while the RIVC model does not. Therefore, if long-term industry performance is an important determinant of the valuation, the implied cost of equity derived from the RIVI model will be superior to the implied cost of equity derived from the RIVC model.

Lastly, we make the same assumptions about dividend payout ratio to both models as follows. When analyst forecasts of dividends are available, we apply those forecasts as future dividends. Otherwise, when analyst forecasts of dividends are unavailable, we estimate the future dividend payout ratio by scaling dividends in the most recent year by earnings over the same year. For the firms with negative earnings, we divide dividends in the most recent year by one-year-ahead or two-year-ahead analyst earnings forecast to derive an estimated payout ratio. If both earning forecasts are still negative, we assume the future dividend pay-

out ratio to be zero. If the estimated dividend payout ratio is larger than 0.5, we assume the payout ratio to be 0.5. We compute future book values of equity using the dividend forecasts (if not available, dividend payout ratio) and analyst earnings forecasts based on the clean surplus relation.

Under these assumptions, we solve for r_t by searching over the range of 0 to 100% for a value of r_t that minimises the difference between the stock prices and the intrinsic value estimates based on analyst earnings forecasts.

3.2.2. The abnormal earnings valuation model

Ohlson and Juettner-Nauroth (2000) provide an alternative to the RIV model in order to mitigate the potential problems in the RIV model, such as the deviations from the clean surplus relation under current accounting rules. According to the OJ model, intrinsic value consists of the capitalised next-period earnings as the first value component and the present value of the capitalised expected changes in earnings, adjusted for dividends, as a second value component (i.e., abnormal earnings). In addition, the OJ model uses $(\gamma-1)$ as the perpetual growth rate of these abnormal earnings as well as the rate at which the short-term growth decays asymptotically to the perpetual growth rate, $(\gamma-1)$. We set $(\gamma-1)$ to be equal to the country-specific risk free rate minus 3%, which is the long-term inflation rate. This assumption on $(\gamma-1)$ is consistent with Gode and Mohanram (2003). Analogous to Claus and Thomas (2001), we set $(\gamma-1)$ to zero when negative. In addition, we assume one-year-ahead dividend payout ratio under the same assumptions as in the RIV model. Let dps_{t+1} be the dividends during future period $t+1$ and denote abnormal earnings growth by $aeg_{t+2} = eps_{t+2} + r_t dps_{t+1} - (1+r_t) eps_{t+1}$. The OJ model of current price per share is then:

$$P_t = \frac{eps_{t+1}}{r_t} + \frac{aeg_{t+2}}{r_t(r_t - \gamma + 1)} \quad (5)$$

Consequently the formula for the implied cost of equity is as follows:

$$r_t = A + \sqrt{A^2 + \frac{eps_{t+1}}{P_t} \left(\frac{(eps_{t+2} - eps_{t+1})}{eps_{t+1}} - (\gamma - 1) \right)} \quad (6)$$

⁸The assumption of the future convergence of ROEs toward the industry median is consistent with Lee et al. (1999), Gebhardt et al. (2001) and Liu et al. (2002). See Myers (1999) for a discussion on inter-temporal consistency.

⁹Since the data is limited for international firms, we use the median of the prior five years. We use the most general I/B/E/S industry classification, 'Sector', when calculating the industry median of ROE.

where

$$A \equiv \frac{1}{2} \left(\gamma - 1 + \frac{dps_{t+1}}{P_t} \right).$$

When $eps_{t+1} > eps_{t+2}$, we assign the short-term earnings growth ($eps_{t+2} - eps_{t+1}$), to zero. When the value inside the root is negative, we assume that the implied cost of equity is A .

Following Easton (2004), we derive the implied cost of equity from the PEG model, which is a special case of the OJ model. Specifically, if we assume that both $\gamma=1$ and $dps_{t+1}=0$ in the OJ model, i.e., assuming no changes in abnormal earnings beyond the forecast horizon and no dividend payments, we can obtain the PEG model as follows:

$$P_t = \frac{eps_{t+2} - eps_{t+1}}{r^2}.$$

Therefore we classify the PEG model as a specific form of the OJ model when we compare the validity of the OJ model with that of the RIV model in Section 5. The implied cost of equity can be obtained as the solution to the above quadratic equation. When $eps_{t+1} > eps_{t+2}$, the implied cost of equity is set as the implied cost of equity derived from the OJ model.¹⁰

3.3. Measurement of risk proxies

Since no generally accepted theory guides a priori selection of risk factors, we choose the following five risk proxies used in prior research.

Market Beta (BETA): The Capital Asset Pricing Model predicts a positive association between a firm's beta and its cost of equity. We estimate beta by regressing at least 30 prior monthly returns up to 60 prior monthly returns against the corresponding market index in each country. We generally use the country indexes compiled by Morgan Stanley, but the CRSP value-weighted market index for US firms.

Market Value of Equity (MV): Penman (2004) indicates the importance of liquidity in explaining the cost of equity. Amihud and Mendelson (1986) argue that firm size does proxy for the liquidity of the stock. We therefore choose the natural log

of market value of equity as the risk proxy regarding to liquidity and expect a negative association between the cost of equity and market value of equity.

Debt-to-Market Ratio (D/M): We use the financial leverage, defined as the book value of debt divided by the market value of equity, to proxy for financing risk. Modigliani and Miller (1958) show that cost of equity should be an increasing function of the financial leverage. Thus we expect a positive association between implied cost of equity and the D/M.

Dispersion of Analyst Earnings Forecasts (EPS DISP): Following Botosan and Plumlee (2002), we consider information risks using the dispersion in analyst earnings forecasts as a risk proxy. We measure the dispersion of analyst earnings forecasts as the standard deviation of the one-year-ahead earnings forecasts scaled by the absolute mean of these forecasts. We expect a positive association between the implied cost of equity and the dispersion of analyst earnings forecasts.

Idiosyncratic Risk (IDRISK): While beta indicates a systematic risk, Lehmann (1990) and Malkiel and Xu (1997), among others, present comprehensive evidence of the importance of idiosyncratic risks. Therefore, we include idiosyncratic risk as the risk factors in the regression test. Our measure of idiosyncratic risk is the variance of residuals from the regressions of beta estimation. We expect a positive association between implied cost of equity and idiosyncratic risk.

4. Sample and descriptive statistics

4.1. Sample selection

Our empirical analysis is based on a sample of firms from seven developed countries from 1993 to 2001. We extract accounting data from COMPUSTAT (US firms) and Global Vantage, stock price, analyst earning forecasts and industry identification code from I/B/E/S (all firms), and stock returns from CRSP (US firms). In addition, we use the 10-year government bond rate from Global Insight as a proxy for the risk free rate.

In September of each year,¹¹ we select firm-years that satisfy the following criteria: (1) non-financial firm, (2) financial statement data for main variables, such as book value of equity, number of shares, are available in COMPUSTAT or Global Vantage,¹² (3) stock price, consensus of one-year-ahead and two-year-ahead analyst earning forecasts, industry identification code and number of shares data are available from I/B/E/S, (4) the currency codes are consistent between Global Vantage and I/B/E/S, and between adjacent years, (5) stock return data are available from CRSP or can be calculated from the Global Vantage, (6) all of the risk proxies, such as beta, are available, (7) book value of equity and stock price are positive,

¹⁰ We choose this assumption in order to keep the firm-years whose one-year-ahead analyst earnings forecasts is larger than two-year-ahead earnings forecasts, since deleting these firms might cause a selection bias toward growth firms.

¹¹ Frankel and Lee (1999) note that regulatory filings are not publicly available until seven months after the fiscal year-end in many countries. We choose the end of September for our analysis to ensure that financial statements of December year-end firms are publicly available.

¹² Following Liu et al. (2002), we set missing dividends to zero.

and (8) the means of one-year-ahead and two-year-ahead analyst earnings forecasts are positive.¹³ This process yields a final sample of 31,199 firm-year observations, consisting of 7,292 firms between 1993 and 2001. Our sample for the main analysis contains 1112, 1393, 760, 594, 6543, 3894 and 16903 firm-year observations for Australia, Canada, France, Germany, Japan, UK and US, respectively.¹⁴ For our analysis of deviation from clean surplus, we use a larger sample only based on Global Vantage because we do not require analyst forecasts data. Our sample does not concentrate in any specific sector within each country.

4.2. Descriptive statistics

Table 1 reports the descriptive statistics of our variables. The pooled mean of one-year-ahead (two-year-ahead) analyst earnings forecasts scaled by stock prices is 0.06 (0.08). The country average two-year-ahead earnings forecasts scaled by stock prices vary from 0.05 (in Japan) to 0.10 (in the UK). This cross-country variation might be due to the definitional difference of earnings or the differences of expected earnings growth and risks across countries. The cross-country variation of the actual earnings scaled by stock prices can be explained by similar reasoning. The mean of the dividend yield varies from 0.01 (in Japan and the US) to 0.04 (in Australia and the UK). This cross-country variation might be due to the difference of dividend payout tendency and tax treatment of dividends across countries.

On the other hand, the cross-country variations of the mean return on equity (from 0.03 of Japan to 0.15 of the UK), of the mean risk-free rate (from 0.02 of Japan to 0.07 of Australia and Canada) and of the mean stock returns (from -0.16 of France to 0.14 of Canada) reflect the varying economic conditions across countries. The cross-country variation in risk proxies indicates the differences of the ex ante firm characteristics related to risk factors across countries. Note that the average beta is below one for some countries. This might reflect a

potential selection bias within our sample toward firms with lower systematic risks. Since the pooled median analyst following is six, using consensus of analyst earnings forecasts may cancel out extreme errors in individual analysts' earnings forecasts. In sum, the descriptive statistics of main variables indicate variation in economic conditions as well as of the accounting standards across countries. Such cross-country variation will tend to increase the power of our test.

Table 2 presents the descriptive statistics of the risk premium estimates for each country. Investigating the aggregate market level cost of equity, Claus and Thomas (2001) conclude that the average implied risk premium derived from the RIV model is around 3% in six developed countries, below the historically average ex post risk premium of 7% to 9%. Consistent with their findings, our implied risk premium derived from the RIVC model is slightly below 3%. Although the RIVI model yields higher implied risk premium than the RIVC model, the level of implied risk premium remains below the historical average ex post risk premium. However, the OJ model and the PEG model produce consistently higher implied risk premium than the RIV model. This result might arise from more optimistic assumptions about future earnings growth by the OJ and PEG models.

Further note that the ex post returns remain more volatile than the implied risk premium: The standard deviation of the ex post returns (RET12) is lowest for Germany at 38.5%, whereas the standard deviations of our implied costs of equity always remain below 8%. This supports the observation in Fama and French (1997), among others, that estimating the cost of equity based on realised stock returns introduces additional noise.

4.3. Descriptive statistics of the deviations from clean surplus

This section reports descriptive evidence on the cross-country variation in the extent to which the clean surplus relation (hereafter CSR) holds. As noted before, the CSR deviations might affect the validity of the RIV model, but not of the OJ model, and so the cross-country variation in the extent of the CSR deviation might lead to the differential relative reliability of the implied cost of equity derived from the RIV model or the OJ model across countries.

As noted by Frankel and Lee (1999), accounting standards often allow some (potentially value-relevant) accounting items to be charged directly to the book value of equity without running through the income statement. That is, these 'dirty surplus adjustments' go against the CSR. For example, under the US GAAP, unrealised gains and losses on marketable securities, foreign currency transla-

¹³ As noted by Gode and Mohanram (2003), empirical implementation of the OJ model requires this condition.

¹⁴ We calculate cum-dividend stock returns for non-US firms from the data of stock prices and dividends extracted from Global Vantage. We adjust all per share numbers for stock splits and stock dividends using I/B/E/S adjustment factors. Also, when I/B/E/S indicates that the consensus forecast for that firm-year is on a fully diluted basis, we use I/B/E/S dilution factors to convert those numbers to a primary basis. Furthermore, to mitigate the effects of outliers, we winsorise all of the risk proxies except market value of equity at the 5% and 95% of the pooled distribution within each country. In addition, we winsorise the industry median of ROE at the risk free rate and 20%. To maintain consistency between calculations of implied costs of equity, we winsorise the cost of equity implied from equation (6), and implied from the PEG model, at 0 and 100%.

Table 1
Descriptive statistics of variables for the pooled sample and by country

This table presents the mean, median and the standard deviations of variables used in this paper for the pooled sample and by country. EPS1/P is the one-year-ahead consensus analyst earnings forecast scaled by stock price. EPS2/P is two-year-ahead consensus analyst earning forecast scaled by stock price. AEPS/P is the actual earnings per share scaled by stock price. ADIV/P is the actual dividend per share scaled by stock price. NUMEST is the number of earnings forecasts. All forecasts are from the September statistical period from I/B/E/S. ROE is the return on book value of equity. BETA is the systematic risk estimated by regressing at least 30 prior monthly returns up to 60 prior monthly returns against the corresponding market index in each country. D/M is the book value of debt divided by market value of equity for each firm. EPSSDISP is the dispersion of analyst earnings forecasts, which is measured as the standard deviation of the one-year-ahead earnings forecasts scaled by the absolute mean of these forecasts. IDRISK is the idiosyncratic risk, which is measured as the variance of residuals from the regressions of beta estimation. RF is the risk-free rate, as proxied by the 10-year long-term government bond rate in each country. RET12 is the realised annual stock return.

	<i>Pooled Sample</i>			<i>Australia</i>			<i>Canada</i>			<i>France</i>		
	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>
EPS1/P	0.06	0.06	0.12	0.08	0.07	0.05	0.07	0.06	0.04	0.06	0.06	0.03
EPS2/P	0.08	0.07	0.19	0.09	0.08	0.06	0.09	0.08	0.05	0.08	0.07	0.04
AEPS/P	0.05	0.05	0.33	0.04	0.06	0.45	0.05	0.05	0.08	0.05	0.05	0.07
ADIV/P	0.02	0.01	0.06	0.04	0.04	0.07	0.02	0.00	0.15	0.03	0.03	0.03
NUMEST	8.46	6.00	6.83	8.82	9.00	4.22	7.31	6.00	4.35	13.65	13.00	7.97
ROE	0.11	0.10	0.13	0.10	0.10	0.12	0.09	0.09	0.11	0.10	0.11	0.09
BETA	0.95	0.90	0.51	0.75	0.75	0.39	0.72	0.67	0.45	0.69	0.68	0.37
D/M	0.46	0.23	0.62	0.34	0.25	0.33	0.50	0.29	0.58	0.49	0.29	0.51
EPSSDISP	0.10	0.05	0.14	0.13	0.08	0.14	0.17	0.10	0.21	0.13	0.08	0.14
IDRISK	0.013	0.009	0.012	0.009	0.006	0.008	0.014	0.009	0.013	0.015	0.010	0.012
RF	0.05	0.06	0.02	0.07	0.06	0.01	0.07	0.06	0.01	0.05	0.06	0.01
RET12	0.07	-0.01	0.68	0.12	0.00	1.50	0.14	0.07	0.62	-0.16	-0.11	0.52
	<i>Germany</i>			<i>Japan</i>			<i>U.K.</i>			<i>U.S.</i>		
	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>
EPS1/P	0.06	0.06	0.05	0.04	0.04	0.04	0.08	0.07	0.05	0.07	0.06	0.16
EPS2/P	0.08	0.07	0.05	0.05	0.04	0.04	0.10	0.08	0.06	0.08	0.07	0.26
AEPS/P	0.03	0.05	0.17	0.02	0.03	0.18	0.07	0.07	0.08	0.06	0.05	0.41
ADIV/P	0.03	0.03	0.03	0.01	0.01	0.01	0.04	0.04	0.04	0.03	0.01	0.07
NUMEST	19.22	17.50	13.15	6.21	5.00	4.54	8.19	6.00	5.85	8.85	6.00	7.15
ROE	0.08	0.08	0.10	0.03	0.04	0.06	0.15	0.14	0.17	0.17	0.14	0.12
BETA	0.62	0.60	0.46	0.97	0.97	0.37	0.73	0.72	0.41	1.04	0.97	0.56
D/M	0.49	0.33	0.53	0.75	0.40	0.89	0.26	0.16	0.27	0.39	0.18	0.53
EPSSDISP	0.14	0.05	0.20	0.18	0.10	0.20	0.08	0.04	0.09	0.07	0.03	0.10
IDRISK	0.032	0.017	0.039	0.009	0.007	0.007	0.010	0.007	0.007	0.015	0.012	0.012
RF	0.05	0.05	0.01	0.02	0.02	0.01	0.06	0.01	0.06	0.06	0.01	0.01
RET12	-0.10	-0.10	0.39	-0.02	-0.11	0.58	0.03	-0.01	0.47	0.12	0.04	0.68

Table 2
Descriptive statistics of risk premium estimates

The table presents the means, medians and standard deviations for risk premium estimates in percent for seven major developed countries from 1993 to 2001. RF is the risk-free rate, as proxied by the 10-year long-term government bond rate. RET12 is the ex post realised annual stock return. OJ is the cost of equity estimate from the OJ model. PEG is the cost of equity estimate from the PEG model. RIVC and RIVI are cost of equity estimates from the RIV model. RIVC assumes a constant residual income after two periods, and RIVI incorporates industry-specific information.

Country	Statistics	RF (%)	RET12 (%)	OJ (%)	PEG (%)	RIVC (%)	RIVI (%)
Australia	Mean	6.5	11.9	7.2	4.0	1.9	2.2
	Median	6.2	0.1	6.4	3.0	1.2	1.7
	Std. Dev.	1.5	150.4	7.1	6.6	5.0	3.7
Canada	Mean	6.5	13.9	7.8	6.3	1.6	2.5
	Median	5.9	6.9	6.7	5.0	1.0	2.1
	Std. Dev.	1.2	61.9	7.2	7.0	4.3	3.6
France	Mean	5.5	-16.3	7.6	5.8	1.9	2.6
	Median	5.5	-11.0	6.5	4.7	1.2	2.0
	Std. Dev.	1.2	52.3	5.5	5.3	3.6	3.5
Germany	Mean	5.1	-9.9	7.3	5.5	1.9	1.9
	Median	5.1	-9.7	6.6	4.7	1.4	1.3
	Std. Dev.	0.9	38.5	5.7	5.4	4.3	3.8
Japan	Mean	2.0	-2.5	6.1	5.6	2.7	2.1
	Median	1.9	-11.1	5.2	4.7	2.3	2.0
	Std. Dev.	0.9	57.6	5.7	5.5	3.6	2.6
UK	Mean	6.4	2.6	7.2	4.5	2.6	4.5
	Median	5.5	-0.8	6.2	3.5	1.7	3.8
	Std. Dev.	1.4	46.8	5.8	5.2	4.9	4.9
US	Mean	5.8	12.4	7.2	5.9	1.6	5.0
	Median	5.9	4.4	6.2	5.0	1.0	4.6
	Std. Dev.	1.0	68.3	5.9	5.8	4.2	3.8

tion gains and losses, and gains and losses on derivative instruments, among others, are charged directly to the book value of equity and not through the income statement. Similarly, in countries such as the UK, Australia and France, fixed assets may be revalued to reflect their market value, with a corresponding adjustment directly to the book value of equity. Another example is the goodwill written off directly against the book value of equity under the UK GAAP during the first half of our sample period. Occasionally, this direct write-off is used by German firms. In countries such as France and Australia, foreign currency translation tends to be an important source of the dirty surplus adjustments.

In local GAAP, the existence of the dirty surplus adjustments does not necessarily lead to the noise in the intrinsic value estimates based on the RIV model. As indicated by Claus and Thomas (2001), if future earnings expectations, proxied by analyst earnings forecasts in our study, satisfy the CSR, the validity of the RIV model should remain unaf-

fected. The effect of analyst forecasts' deviations from the CSR on the validity of the RIV model implementation can be described as follows. Based on the assumption of the CSR, we start from the prior year's actual book value of equity, and add earnings forecast, then subtract forecasted dividend. This yields a predicted book value of equity. If analysts' expectations on the future book value of equity deviate from the predicted book value of equity, our intrinsic value estimates might differ from the firm values in analysts' or investors' minds. This difference will also bias the implied cost of equity, which is derived from the assumed equation between stock prices and analysts' valuations.

We initially intended to provide descriptive evidence of *ex ante* deviations from the CSR from three sets of consensus analyst forecasts from I/B/E/S. Specifically we required that three sets of consensus forecasts on book value of equity, earnings, and dividends are available for each firm-year. However, since the resulting sample is quite



small, we cannot reliably compare the extent of the ex ante CSR deviations across countries. Furthermore, the extent of ex ante CSR deviations is also affected by variation in the composition of analysts used to calculate the consensus forecasts.

Given this limitation in data, we report the ex post deviations from the CSR as indirect descriptive evidence. Our implicit assumption is that analyst earnings forecasts' potential deviations from the CSR may be proportional to the magnitude of the ex post deviations from the CSR in our sample. Under this assumption, the effect of the potential CSR deviations from analyst earnings forecasts on the validity of the RIV model can be tested indirectly by examining whether the cross-country variation of the relative reliability of the implied cost of equity derived from the RIV model or the OJ model relate to this ex post deviations from the CSR.

We measure the magnitude of the ex post CSR deviation by the difference between the comprehensive income¹⁵ and the net income¹⁶ scaled by

the book value of equity (hereinafter DSPB), following Lo and Lys (2001). To describe the general magnitude of the CSR deviation within a country, we include all of the firm-years for which the required data for the CSR analysis are available. Figure 1 represents for each country the cumulative distributions of DSPB with the familiar S-shape arising from a bell-curved histogram. Visual inspection suggests that the UK data appears to be second order stochastically dominated by US, Japan, Australia and Canada, but comparable to France and Germany. Recall that second order stochastic dominance implies that CSR deviations contain additional noise in the European countries. It is therefore not surprising when we also find that the variance of deviations from CSR is higher among the European countries.

Panel A of Table 3 reports the distribution of the DSPB within each of the seven countries. Following Liu et al. (2002), we compare the magnitude of the CSR deviation across countries in several different ways. First, the interquartile range of the DSPB distributes from 1% (Australia) to 6% (France).¹⁷ This measure implies that for half of the firms, the CSR deviations from Australian firm-years exceed 0.05% of the book value of equity while half of French CSR deviations exceed 3%. Panel C of Table 3 reports the t-statistics based on bootstrap-type analysis,¹⁸ indicating that the differences of interquartile ranges across countries are statistically significant in most cases. Second, as a supplementary metric, Panel B of Table 3 reports the mean of the absolute DSPB and the percentage of sample whose absolute DSPB is below 3% or 10%.¹⁹ The mean of the absolute DSPB distributes from 3% (Japan) to 13% (the UK). Panel C of Table 3 indicates that the cross-country differences on the mean of the absolute DSPB are statistically significant. Moreover, Panel B of Table 3 shows that 44% (83%) of French (Japanese) firm-years has the ex post CSR deviation smaller than 3% of the book value of equity. Bootstrap t-statistics (untabulated) indicate that the cross-country differences of the percentage with absolute DSPB is below 3% or 10% are statistically significant.

Although we measure the magnitude of the CSR deviation in several different ways, all measures uniformly indicate that there are significant ex post deviations from the CSR within all of the countries. Further, the cross-country differences of the magnitude of the CSR deviation are significant. On the basis of these measures, we classify Australia, Canada, Japan, and the US as the countries where the CSR deviation is relatively small and classify France, Germany and the UK as the countries where the CSR deviation is relatively large.

In sum, we observe significant deviations from the ex post CSR within all of our countries, and the

¹⁵ In Global Vantage (abbreviated GV), retained earnings do not include all dirty surplus items. We therefore measure the comprehensive income by the annual change of the sum of a firm's retained earnings (GV #131), revaluation reserve (GV #130), unappropriated net profit (GV #132), other equity reserves (GV #133), and cumulative translation adjustment (GV #134), adding in common dividends (GV #36). To ensure the robustness of our comprehensive income measure, we perform additional analyses on US firms: following Dhaliwal et al. (1999) we measure the comprehensive income of US firms by the annual change in a firm's retained earnings (Compustat item #36), which includes the dirty surplus items, and add common dividends (Compustat item #21). These untabulated results for US firms are very similar to those using the Global Vantage dataset.

¹⁶ Net income is measured by Global Vantage item #32.

¹⁷ We calculate the interquartile range of DSPB as the main metric to assess the magnitude of the CSR deviation since the DSPB cannot perfectly measure the CSR deviations from the firm-years in the tail. For example, a merging firm's retained earnings will increase by the merged firm's retained earnings under the pooling of interest method. Although this is not the deviations from the CSR, our DSPB measure will count this increase in the deviation from the CSR. It is conceivable that the firm-years in the tail will be affected by these non-dirty surplus items to a relatively larger extent. However, the interquartile range can mitigate this concern since the statistic is not affected by the firm-years in the tail. In addition, this statistic is sensible only when the middle of the distribution is zero. As indicated by Panel A of Table 3, the median of the distribution is around zero within all countries.

¹⁸ The bootstrap-type analysis results in 58,943 firm-years by drawing observations randomly from the constructed sample with replacement. For each trial, we compute the interquartile range of the DSPB for each country and then compute the difference of interquartile range across countries. This process is repeated 100 times and a distribution for the difference of interquartile range across countries is obtained. A t-statistic is computed as the mean divided by the standard deviation of this distribution. This analysis follows Liu et al. (2002).

¹⁹ Unlike the interquartile range, this measure is unaffected by cross-country variation in skewness and by the firm-years in the tails.

Figure 1**The cumulative distributions of ex post deviations from the clean surplus relation**

Figure 1 presents the cumulative distributions of ex post deviations from the clean surplus relation for each sample country. The ex post CSR deviation is calculated by the difference between the comprehensive income and the net income scaled by the book value of equity. In each figure, the horizontal axis represents the extent of deviation from clean surplus relation, where zero indicates no deviation; the vertical axis represents the cumulative distribution of ex post deviation, which is bounded by 0 and 1.

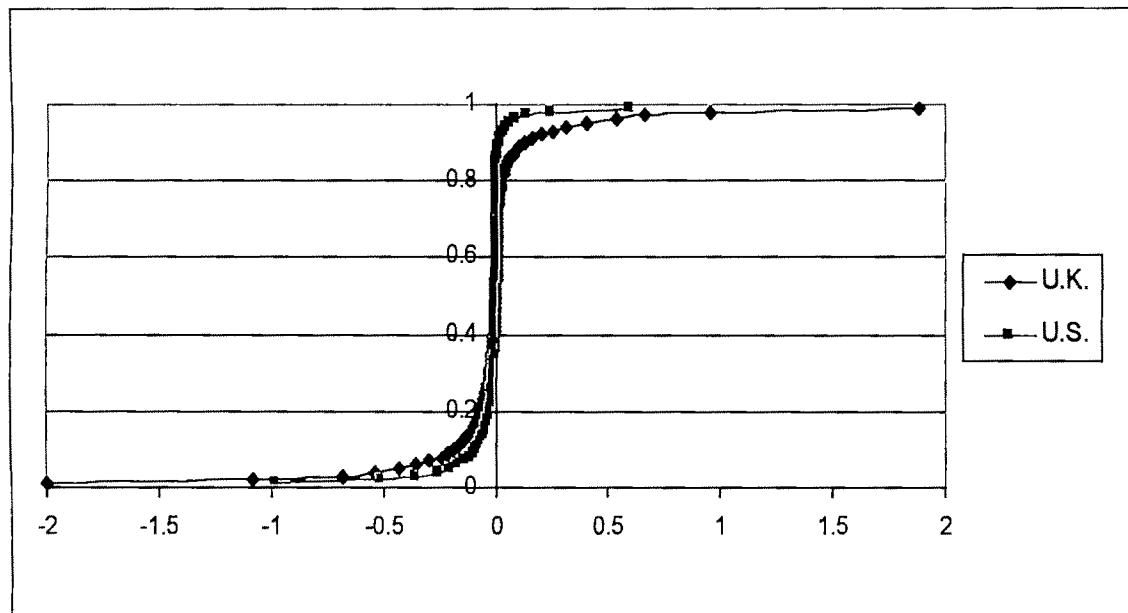
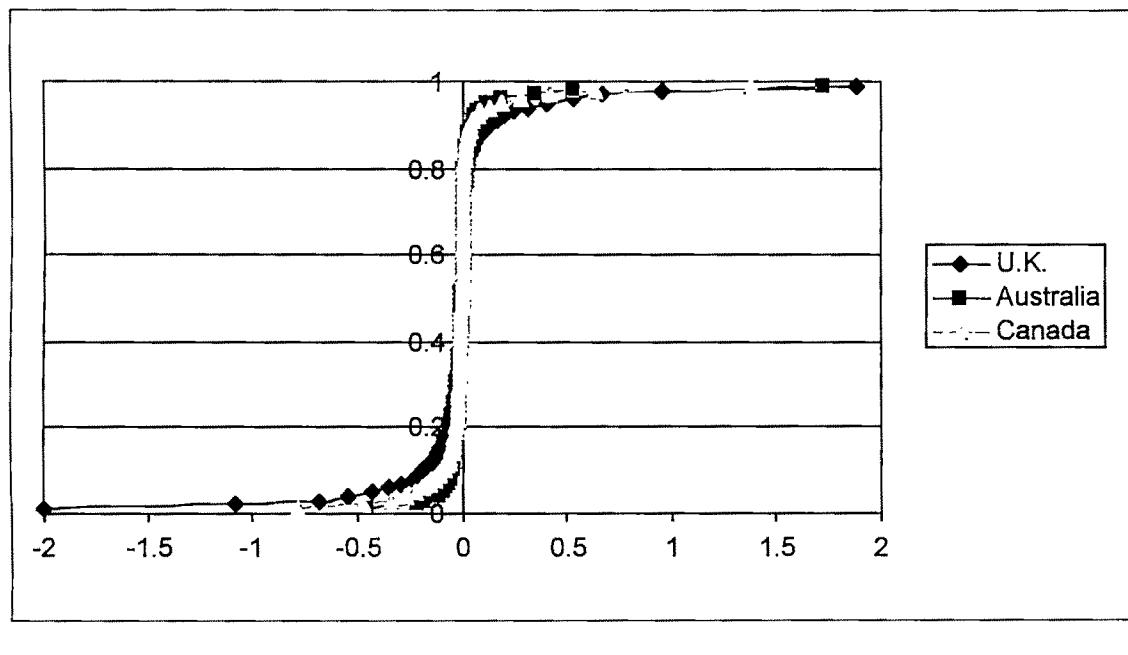
Panel A. United Kingdom and United States**Panel B. Australia, Canada and United Kingdom**

Figure 1

The cumulative distributions of ex post deviations from the clean surplus relation (*continued*)

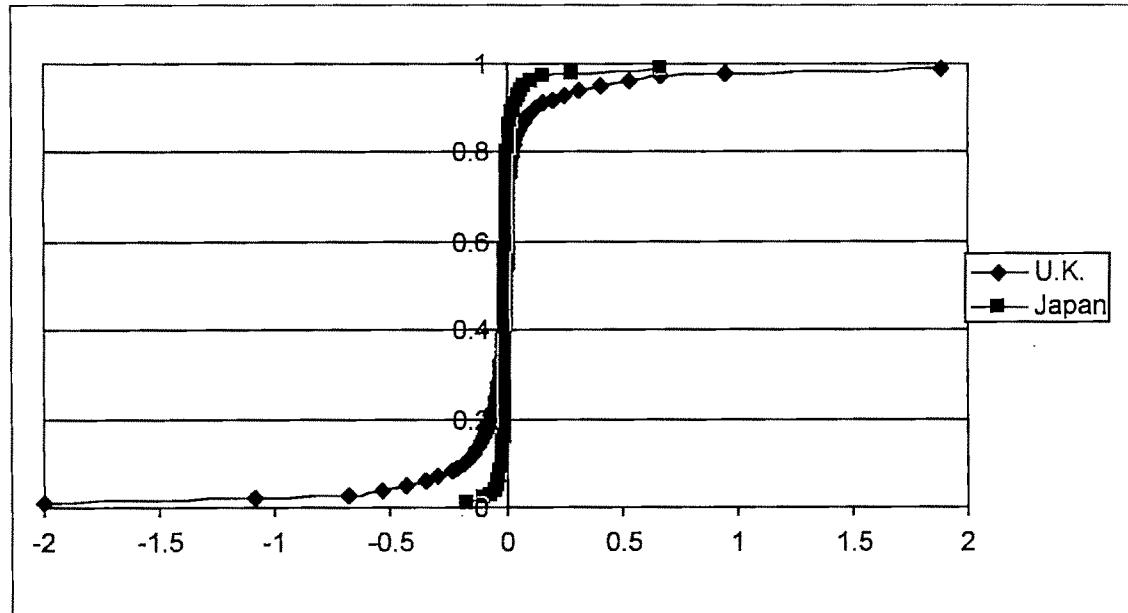
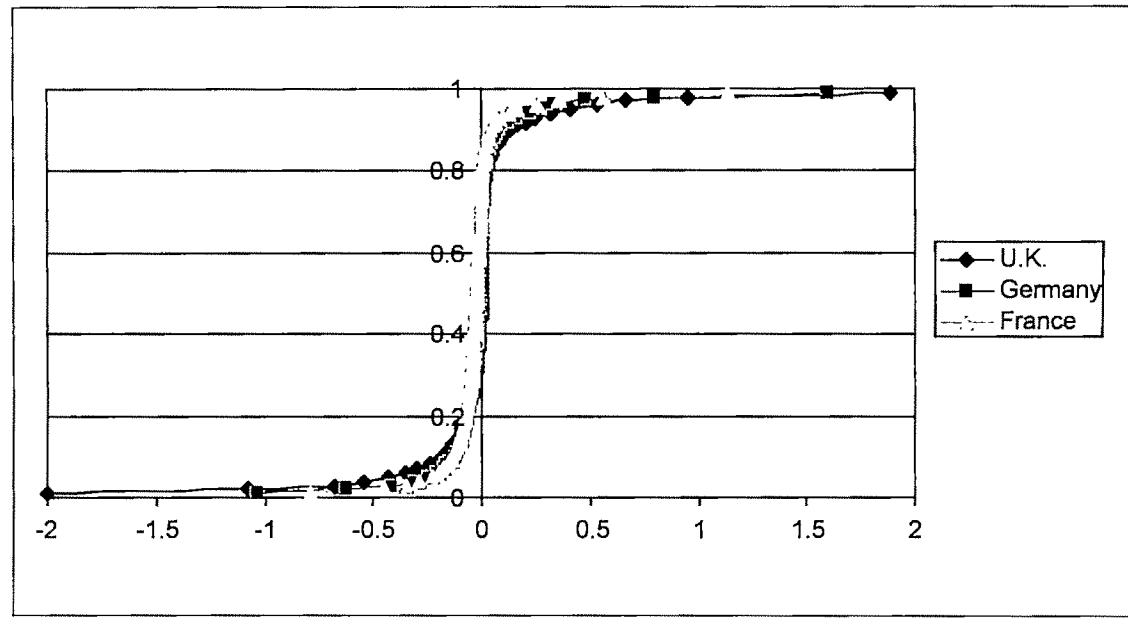
Panel C. Japan and United Kingdom**Panel D. France, Germany, and United Kingdom**

Table 3
Ex post deviations from the clean surplus relation

This table presents the descriptive statistics of ex post deviations from the clean surplus relation (CSR) for each sample country. The ex post CSR deviation is calculated by the difference between the comprehensive income and the net income scaled by the book value of equity. Panel A presents the mean, median, the standard deviation, and the interquartile range. We winsorise the ex post CSR deviations at -1 and 1. Panel B presents the ex post CSR deviations in absolute values, which are winsorised at 1. Similar statistics are presented in Panel B. In addition, ADS3% (ADS10%) is the percentage of firm-years with CSR deviation smaller than 3% (10%) of book value of equity. Panel C presents the t-statistics for the difference of CSR deviation. The upper triangle is t-statistics for the differences of mean absolute CSR deviation presented in Panel B. The lower triangle is the bootstrap t-statistics for the differences of interquartile range statistics presented in Panel A. The critical value for the pair-wise t-test is 1.96.

Panel A. The distribution of ex post CSR deviation per book value of equity

Country	No. of firm-years	Mean	Median	Std. Dev.	Interquartile Range
Australia	2,087	0.011	0.000	0.170	0.009
Canada	3,311	-0.006	0.000	0.208	0.021
France	3,082	-0.027	-0.024	0.196	0.058
Germany	3,264	-0.008	-0.001	0.227	0.054
Japan	16,582	0.012	-0.001	0.121	0.010
UK	7,425	-0.014	-0.001	0.274	0.053
US	23,192	-0.044	0.000	0.225	0.022

Panel B. The distribution of ex post CSR deviation in absolute values per book value of equity

Country	Mean	Median	Std. Dev.	ADS3%	ADS10%
Australia	0.053	0.005	0.156	0.750	0.899
Canada	0.077	0.010	0.187	0.689	0.841
France	0.091	0.036	0.174	0.440	0.801
Germany	0.099	0.026	0.202	0.526	0.789
Japan	0.034	0.005	0.117	0.831	0.939
UK	0.129	0.026	0.242	0.520	0.730
US	0.060	0.007	0.164	0.730	0.875

Panel C. t-statistics for the pair-wise differences of CSR deviation

	Australia	Canada	France	Germany	Japan	U.K.	U.S.
Australia		-4.79	-8.03	-8.89	6.83	-13.60	-1.91
Canada	7.09		-3.21	-4.74	17.14	-11.12	5.26
France	24.51	18.31		-1.74	22.89	-7.93	9.74
Germany	17.84	13.30	-1.69		25.40	-6.16	12.36
Japan	0.04	-9.29	-29.22	-20.33		-41.16	-17.82
UK	19.73	14.22	-2.13	-0.16	21.93		27.80
US	11.02	1.41	-21.61	-14.12	20.44	-14.97	

cross-country variation of the ex post CSR deviation is significant. Assuming that the ex post CSR deviation is positively related to the ex ante CSR deviation, the cross-country variation of the CSR deviation will provide a good empirical setting in which we can examine the effects of the CSR deviation on the validity of the RIV model.

5. Empirical results

5.1. Univariate analysis

In this section, we report the pair-wise correlations of key variables. Panel A of Table 4 presents Pearson correlations between implied costs of equity. First, as expected, the implied costs of equity derived from the OJ model are very highly correlated with the implied costs of equity derived from the PEG model within all of the countries. Second, the implied costs of equity derived from the RIVC and RIVI model are more highly correlated with each other than with costs of equity derived from the OJ or PEG model within all of the countries. That the correlations among the implied costs of equity emerging from different valuation models remain below one unit supports the argument that the implied costs of equity exhibit different degrees of reliability.

Panel B of Table 4 reports the Pearson correlations between the risk proxies. Many of these correlations are significantly different from zero. This suggests that multicollinearity may prevent the detection of statistical significance of the coefficients on risk proxies. Panel C of Table 4 presents the Pearson correlation between our risk proxies and the implied costs of equity. Within all countries, the implied costs of equity are significantly correlated with the risk proxies in a manner consistent with our expectations. The correlations between the implied costs of equity and realised stock returns are typically insignificant, with Japan and the US as notable exceptions. Overall, the implied cost of equity appears to be a reasonable proxy for the ex

ante cost of equity in all of the countries, and the ex ante cost of equity inferred from the implied cost of equity can differ significantly from the ex ante cost of equity proxied by the realised stock returns.

Since most of the implied costs of equity are significantly correlated with most of risk proxies, it is difficult to evaluate the relative reliability of the implied costs of equity exclusively on the basis of pair-wise correlations. Therefore, we report multivariate regressions which compare the overall associations between the implied costs of equity and the risk proxies.

5.2. Multivariate analysis

This section discusses the results of our multivariate regression tests. We regress the alternative implied costs of equity on the individual risk proxies as the independent variables.²⁰ We then assess which valuation model produces a more reliable implied cost of equity by identifying the implied cost of equity that produces a higher adjusted R^2 within each country.²¹ Since the coefficients of risk proxies can be biased due to the multicollinearity problem, we focus on the analysis of R^2 's rather than on the coefficients of the risk proxies.

Specifically, to remove the effects of cross-sectional correlation in error terms inherent in panel data and to allow the coefficient of risk proxies to change in each year, we follow the Fama and MacBeth (1973) approach to regression analyses. This procedure involves two steps. First, we estimate the regression model separately for each year of data in the sample. Next, the coefficients and adjusted R^2 from each of these regressions are averaged across all years. We report the means of the estimated coefficients and the adjusted R^2 along with t-statistics based on the time-series standard errors of the individual estimated coefficients with correction for serial correlation.²²

Panel A of Table 5 reports the results of this regression. Consider the polar cases of Australia and France. In Australia, the RIVI model produces the highest adjusted R^2 of 0.47. The RIVC model produces a relatively high adjusted R^2 of 0.35. In contrast, the OJ (PEG) model generates low adjusted R^2 of 0.16 (0.18). Consider next the pattern observed for France: The OJ and PEG models result in high R^2 's of 0.43 while the RIVC (RIVI) model generates lower R^2 of 0.32 (0.30). As indicated in Panel B of Table 5, the differences between the two RIV-based models and the two OJ-based models are statistically significant but ordered reversely.²³ Canada, Japan, and US offer evidence similar to Australia. This is as we would expect since the deviations from the clean surplus relation are lowest in these countries. While for Germany and the UK, the differences between valuation models based on RIV and OJ are statistically insignificant, the results are qualitatively more similar to France

²⁰ To control for the effect of the risk-free rate, we use the implied risk premium as the dependent variable.

²¹ Consider Australia as an example. The pair-wise correlation analysis (in Panel C of Table 4) indicates that all of the implied costs of equity have significant correlations with four out of five risk proxies. However, Panel A of Table 5 indicates that two risk proxies impact all of the implied costs of equity.

²² Following Bernard (1987), we adjust the t-statistics for serial correlation, assuming the annual coefficients follow a first-order auto-regressive process. The correction factor is

$$\sqrt{[(1 + \phi) / (1 - \phi)] - [2\phi(1 - \phi^*) / n(1 - \phi)^2]}$$

where ϕ is the serial correlation in the coefficient and n is the number of years.

²³ This bootstrap-type analysis results in 31,199 firm-years. For each trial, we compute the adjusted R^2 from four valuation models within each country and then compute the difference of adjusted R^2 across four valuation models. Proceeding as described in footnote 18, we generate t-statistics.

Table 4
Correlations of implied costs of equity and risk proxies

This table presents the Pearson correlations of implied costs of equity and risk proxies for the pooled sample and for each country. OJ is the cost of equity estimate from the OJ model. PEG is the cost of equity estimate from the PEG model. RIVC is the cost of equity estimate from the RIV model assuming a constant residual income after two periods. RIVI is the cost of equity estimate from the RIV model but incorporating industry-specific information. BETA is the systematic risk estimated by regressing at least 30 prior monthly returns up to 60 prior monthly returns against the corresponding market index in each country. MV is the market value of equity for each firm-year. D/M is the book value of debt divided by market value of equity for each firm. EPDSISP is the dispersion of analyst earnings forecasts, which is measured as the standard deviation of the one-year-ahead analyst earnings forecasts scaled by the absolute mean of these forecasts. IDRISK is the idiosyncratic risk, which is measured as the variance of residuals from the regressions of beta estimation. RET12 is the realised annual stock return. ***, **, * indicate, respectively, the significance level at the 1%, 5% and 10% level or better.

Panel A. Pearson correlations between implied costs of equity

	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>	<i>Canada</i>	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>
Australia	0.97***				0.99***		
PEG	0.97***			PEG	0.99***		
RIVC	0.57***	0.57***		RIVC	0.49***		
RIVI	0.47***	0.48***	0.79***	RIVI	0.35***	0.40***	0.72***
France	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>	<i>Germany</i>	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>
PEG	0.99***			PEG	0.98***		
RIVC	0.54***	0.55***		RIVC	0.40***		
RIVI	0.49***	0.51***	0.83***	RIVI	0.31***	0.30***	0.59***
Japan	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>	<i>U.K.</i>	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>
PEG	1.00***			PEG	0.97***		
RIVC	0.54***	0.53***		RIVC	0.58***		
RIVI	0.42***	0.40***	0.72***	RIVI	0.44***	0.43***	0.74***
U.S.	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>	<i>Pooled</i>	<i>OJ</i>	<i>PEG</i>	<i>RIVC</i>
PEG	0.99***			PEG	0.98***		
RIVC	0.48***	0.51***		RIVC	0.56***		
RIVI	0.44***	0.49***	0.73***	RIVI	0.51***	0.51***	0.71***

Table 4
Correlations of implied costs of equity and risk proxies (continued)

Panel B. Pearson correlations between risk proxies and realised annual stock returns

Australia	BETA	MV	D/M	EPSDISP	IDRISK	Canada	BETA	MV	D/M	EPSDISP	IDRISK
MV	0.12***					MV	0.02	-0.09***			
D/M	0.08**	-0.02				D/M	0.00	-0.04			
EPSDISP	0.20***	-0.15***	0.28***			EPSDISP	0.19***	0.17***			
IDRISK	0.18***	-0.10***	0.00	0.31***		IDRISK	0.26***	-0.17***	-0.06*	0.17***	
Ret12	-0.03	0.00	0.03	-0.02	-0.03	Ret12	-0.08***	-0.05	0.03	0.02	0.05
France	BETA	MV	D/M	EPSDISP	IDRISK	Germany	BETA	MV	D/M	EPSDISP	IDRISK
MV	0.13***					MV	0.23***				
D/M	0.01	-0.12***				D/M	0.05	-0.12***			
EPSDISP	0.03	-0.14***	0.37***			EPSDISP	0.06	-0.07*	0.25***		
IDRISK	-0.03	-0.11***	0.04	0.06*		IDRISK	0.10**	-0.04	-0.03	-0.16***	
Ret12	-0.04	-0.02	0.09**	-0.05	0.07*	Ret12	-0.08	0.05	-0.04	-0.15***	0.15***
Japan	BETA	MV	D/M	EPSDISP	IDRISK	UK	BETA	MV	D/M	EPSDISP	IDRISK
MV	-0.06***					MV	0.02				
D/M	0.08***	-0.04***				D/M	0.02	-0.07***			
EPSDISP	0.18***	-0.06***	0.28***			EPSDISP	0.07***	-0.05***	0.35***		
IDRISK	0.42***	-0.15***	0.02*	0.12***		IDRISK	0.09***	-0.09***	0.07***	0.25***	
Ret12	-0.03***	-0.01	0.05***	0.03**	0.02*	Ret12	0.04**	-0.02	-0.04**	-0.04**	-0.01
US	BETA	MV	D/M	EPSDISP	IDRISK	Pooled	BETA	MV	D/M	EPSDISP	IDRISK
MV	-0.04***					MV	-0.03***				
D/M	-0.17***	-0.07***				D/M	-0.06***	-0.02***			
EPSDISP	0.09***	-0.07***	0.24***			EPSDISP	0.07***	0.02***	0.31***		
IDRISK	0.45***	-0.15***	-0.12***	0.20***		IDRISK	0.33***	-0.10***	-0.08***	0.07***	
Ret12	0.04***	-0.03***	-0.01	-0.03***	-0.02***	Ret12	0.03***	-0.03***	-0.01	-0.03***	0.01

Table 4
Correlations of implied costs of equity and risk Proxies (*continued*)

Panel C. Pearson correlations between implied costs of equity and risk proxies

		<i>RIVI</i>	<i>RIVC</i>								
<i>Australia</i>	<i>OJ</i>		<i>PEG</i>		<i>RIVC</i>		<i>RIVI</i>		<i>PEG</i>		<i>RIVC</i>
BETA	0.03	0.07**	-0.02	0.04					0.20***	0.06*	0.10***
MV	-0.13***	-0.11***	-0.19***	-0.20***					-0.15***	-0.19***	-0.21***
D/M	0.20***	0.19***	0.40***	0.57***					0.16***	0.29***	0.36***
EPSDISP	0.28***	0.34***	0.21***	0.35***					0.28***	-0.08***	0.12***
IDRISK	0.10***	0.20***	0.17***	0.21***					0.21***	0.16***	0.22***
Ret12	0.01	0.01	0.00	0.01					0.04	0.05	0.08***
<i>France</i>	<i>OJ</i>		<i>PEG</i>		<i>RIVC</i>		<i>RIVI</i>		<i>PEG</i>		<i>RIVC</i>
BETA	0.07*	0.08*	-0.05	-0.05					0.24***	0.14***	0.09*
MV	-0.17***	-0.17***	-0.23***	-0.25***					-0.14***	-0.15***	-0.17***
D/M	0.55***	0.54***	0.45***	0.41***					0.36***	0.33***	0.48***
EPSDISP	0.47***	0.48***	0.17***	0.29***					0.36***	0.38***	0.19***
IDRISK	0.14***	0.14***	0.15***	0.25***					-0.03	-0.04	-0.05
Ret12	0.12***	0.07*	-0.01	-0.07*					0.04	0.02	-0.07*
<i>Japan</i>	<i>OJ</i>		<i>PEG</i>		<i>RIVC</i>		<i>RIVI</i>		<i>PEG</i>		<i>RIVC</i>
BETA	0.11***	0.13***	0.01	-0.02					0.05***	0.04***	-0.09***
MV	-0.08***	-0.07***	-0.15***	-0.21***					-0.14***	-0.15***	-0.13***
D/M	0.17***	0.16***	0.17***	0.25***					0.35***	0.33***	0.45***
EPSDISP	0.24***	0.24***	-0.07***	0.12***					0.35***	0.37***	0.25***
IDRISK	0.33***	0.35***	0.37***	0.29***					0.18***	0.15***	0.25***
Ret12	0.12***	0.12***	0.21***	0.23***					0.01	0.01	0.07***
<i>US</i>	<i>OJ</i>		<i>PEG</i>		<i>RIVC</i>		<i>RIVI</i>		<i>PEG</i>		<i>RIVC</i>
BETA	0.14***	0.17***	-0.07***	0.07***					0.09***	0.14***	-0.08***
MV	-0.13***	-0.15***	-0.14***	-0.20***					-0.13***	-0.12***	-0.20***
D/M	0.22***	0.22***	0.42***	0.40***					0.10***	0.12***	0.20***
EPSDISP	0.35***	0.35***	0.04***	0.19***					0.18***	0.20***	0.09***
IDRISK	0.23***	0.30***	0.02**	0.223***					0.22***	0.27***	-0.07***
Ret12	0.03***	0.03***	0.04***	0.03***					0.04***	0.08***	0.22***

Table 5
Cross-sectional year-by-year regressions of implied risk premia

This table presents the cross-sectional year-by-year regressions of implied risk premia for each country. The regression equation is as follows.

$$\text{RISKPREMIUM}_u = (\text{Intercept}) + \alpha_1 \text{BETA}_u + \alpha_2 \text{MV}_u + \alpha_3 \text{D/M}_u + \alpha_4 \text{EPSDISP}_u + \alpha_5 \text{IDRISK}_u + \varepsilon_u$$

RISKPREMIUM is defined as the cost of equity estimate minus the country-specific risk free rate. OJ is the cost of equity estimate from the PEG model. RIVC is the cost of equity estimate from the RIV model assuming a constant residual income after two periods. RIVI is the cost of equity estimate from the RIV model but incorporating industry-specific information. BETAU is the systematic risk estimated by regressing at least 30 prior monthly returns up to 60 prior monthly returns against the corresponding market index in each country. MV is the market value of equity for each firm/year. D/M is the debt divided by market value of equity for each firm. EPSDISP is the dispersion of analyst earnings forecasts, which is measured as the standard deviation of the one-year-ahead earnings forecasts scaled by the absolute mean of these forecasts. IDRISK is the idiosyncratic risk, which is measured as the variance of residuals from the regressions of beta estimation. The coefficients presented are the means from annual regressions. The number below each coefficient is the t-statistic, adjusted for auto-correlation as in Bernard (1987). Adj-R² is the average adjusted R² for the regressions. Average sample size is the average number of samples per year for each sample country. Panel B shows the bootstrap t-statistics for the differences of adjusted R²s. The null hypothesis is no difference between any pair of adjusted R²s in the cross-sectional regressions. ***, **, * indicate, respectively, the significance level at the 1%, 5% and 10% level or better.

Panel A. Regressions of implied risk premia with risk proxies

Country	Model	Intercept	BETA	MV	D/M	EPSDISP	IDRISK	Adj-R ²	No. of years	Average sample size
	Expected signs	?	+	-	+	+	+	+		
Australia	OJ	0.12	0.00	-0.01	0.03	0.10	-0.31	0.16	9	124
	t-stat	12.61	0.32	-15.18	4.23	4.88	-0.53			
	PEG	0.06	0.00	-0.01	0.02	0.11	0.33	0.18	9	124
	t-stat	6.73	0.55	-12.09	2.48	6.87	0.65			
	RIVC	0.08	0.00	-0.01	0.04	-0.02	-0.02	0.35	9	124
	t-stat	3.69	0.12	-5.97	2.91	-0.79	-0.04			
	RIVI	0.05	0.00	-0.01	0.04	0.01	0.02	0.47	9	124
	t-stat	2.53	1.17	-5.53	6.21	3.91	0.06			
Canada	OJ	0.09	0.02	-0.01	0.01	0.07	0.31	0.14	9	155
	t-stat	2.47	2.82	-1.72	8.94	5.48	0.91			
	PEG	0.08	0.02	-0.01	0.01	0.06	0.44	0.17	9	155
	t-stat	2.36	2.77	-2.42	7.94	5.18	1.39			
	RIVC	0.05	0.01	-0.01	0.02	-0.04	0.31	0.21	9	155
	t-stat	2.01	2.07	-3.61	12.45	-4.88	3.32			
	RIVI	0.05	0.01	-0.01	0.02	0.00	0.22	0.30	9	155
	t-stat	1.93	2.41	-4.46	7.79	-0.82	3.98			

Table 5
Cross-sectional year-by-year regressions of implied risk premia (continued) (Panel A continues)

Country	Model	Intercept	BETA	MV	D/M	EPS/DISP	IDRISK	Adj-R ²	No. of years	Average sample size
Expected signs	?	+	-	+	+	+	+			
France	OJ	0.08	0.01	-0.01	0.04	0.11	0.40	0.43	8	95
	t-stat	8.06	3.18	-8.00	10.75	11.85	1.03			
	PEG	0.06	0.01	-0.01	0.04	0.10	0.40	0.43	8	95
	t-stat	7.49	4.27	-10.63	10.48	11.37	1.08			
	RIVC	0.07	0.01	-0.01	0.03	-0.02	-0.28	0.32	8	95
	t-stat	3.21	0.89	-4.44	3.13	-1.12	-2.13			
	RIVI	0.06	0.01	-0.01	0.02	0.01	-0.11	0.30	8	95
	t-stat	3.69	0.97	-9.91	4.33	0.49	-0.92			
Germany	OJ	0.08	0.03	-0.01	0.03	0.06	-0.17	0.25	7	85
	t-stat	1.51	4.33	-1.28	8.03	3.25	-2.95			
	PEG	0.05	0.03	0.00	0.02	0.06	-0.13	0.25	7	85
	t-stat	0.93	4.19	-0.90	4.05	4.21	-2.39			
	RIVC	0.07	0.01	-0.01	0.01	-0.02	-0.24	0.26	7	85
	t-stat	1.40	5.22	-1.89	5.43	-0.97	-1.11			
	RIVI	0.04	0.01	-0.01	0.02	0.00	-0.13	0.32	7	85
	t-stat	1.25	1.32	-3.80	24.83	-0.88	-1.21			
Japan	OJ	0.09	0.00	0.00	0.00	0.04	0.65	0.11	9	727
	t-stat	1.72	1.81	-1.42	1.69	8.73	2.85			
	PEG	0.08	0.00	0.00	0.00	0.04	0.78	0.12	9	727
	t-stat	1.70	2.23	-1.50	1.50	8.52	3.59			
	RIVC	0.10	0.00	-0.01	0.00	-0.03	0.17	0.29	9	727
	t-stat	1.66	-1.40	-1.65	0.72	-7.57	1.49			
	RIVI	0.09	0.00	-0.01	0.00	0.00	-0.38	0.33	9	727
	t-stat	1.97	-1.23	-2.24	1.34	0.30	-3.85			
UK	OJ	0.15	0.01	-0.01	0.04	0.14	0.37	0.31	9	433
	t-stat	4.79	5.61	-5.62	7.35	5.50	3.30			
	PEG	0.11	0.01	-0.01	0.03	0.13	0.73	0.32	9	433
	t-stat	3.35	4.56	-5.29	7.18	6.15	10.21			
	RIVC	0.11	0.01	-0.01	0.05	-0.02	-0.16	0.30	9	433
	t-stat	1.87	3.25	-2.56	5.11	-1.73	-0.78			
	RIVI	0.12	0.01	-0.01	0.05	0.02	0.20	0.31	9	433
	t-stat	1.96	1.48	-2.50	5.73	4.19	1.41			

Table 5
Cross-sectional year-by-year regressions of implied risk premia (continued) (Panel A continues)

Country	Model	Intercept	BETA	MV	D/M	EPSDISP	MDRISK	Adj-R ²	No. of years	Average sample size
US	OJ	?	+	-	+	+	+	0.26	9	1,878
	t-stat	0.09	0.01	-0.01	0.02	0.14	0.41			
	PEG	4.29	9.71	-4.97	4.49	7.49	1.42			
	t-stat	0.08	0.01	-0.01	0.01	0.13	0.57	0.30	9	1,878
	RIVC	3.38	10.08	-5.58	4.61	6.85	1.87			
	t-stat	0.06	0.00	-0.01	0.03	-0.04	-0.21	0.27	9	1,878
	RIVI	2.63	0.70	-3.25	10.49	-10.11	-1.65			
	t-stat	0.09	0.01	-0.01	0.02	0.00	0.03	0.35	9	1,878
	RIVI	2.96	6.31	-3.88	12.55	-0.27	0.14			

Panel B. t-statistics for the differences of Adjusted R²

Country	OJ	PEG	RIVC	Country	OJ	PEG	RIVC
Australia	PEG	2.10**		Canada	PEG	7.25***	
	RIVC	5.23***	4.45***		RIVC	2.69***	1.60
	RIVI	8.52***	7.64***		RIVI	4.92***	3.81***
France	PEG	0.69		Germany	PEG	0.40	
	RIVC	-1.40	-1.52		RIVC	0.45	0.37
	RIVI	-1.69*	-1.83*		RIVI	1.32	1.28
Japan	PEG	3.39***		UK	PEG	1.97**	
	RIVC	14.80***	14.41***		RIVC	0.03	-0.49
	RIVI	12.76***	12.48***		RIVI	0.64	0.16
US	PEG	32.38***		US	PEG	0.77	
	RIVC	1.67*	-3.01***		RIVC	0.16	0.77
	RIVI	7.29***	3.73***		RIVI	0.64	0.16

OJ
 PEG
 RIVC

than to Australia. Again, this evidence is consistent with our argument that the OJ and PEG models should perform relatively better in countries with large deviations from clean surplus, which we documented in Section 4.3.

As a supplementary test, not reported, we include the logarithm of the book-to-market ratio in our regression in Table 5. Prior studies view the book-to-market ratio as a proxy for risk (Griffin and Lemmon, 2002; Berk, 1995) or mispricing (Daniel and Titman, 1997). If the book-to-market ratio reflects mispricing of stocks rather than risks, as suggested by several studies, our analysis based on adjusted R^2 would be mechanically biased toward a more favorable evaluation of the RIV model. This is because the book-to-market ratio being used to impute the RIV-based costs of equity could mechanically affect its association with the implied costs of equity and generate higher adjusted R^2 s. Our untabulated results confirm this, but the relative orderings remain qualitatively robust.

In summary, the RIV model clearly outperforms the OJ model (including the PEG model) within all non-European countries that we consider in terms of the adjusted R^2 . Furthermore, despite its theoretical foundation, the OJ model appears to offer little advantage at the implementation stage in comparison to the PEG model, a naive heuristic for valuation. In addition, the deviations from the CSR seem to affect the relative performance of the RIV and OJ models.

6. Conclusion

We examine the relative reliability of the implied costs of equity within seven developed countries. We conclude that the implied costs of equity derived from the RIV models are more reliable than those implied from the OJ model in non-European countries. In Europe the OJ model performs better – or as well as – the RIV model. Further, we document that the deviations from the clean surplus relation within a country affects which accounting-based valuation model produces the more reliable implied costs of equity.

Our analyses and findings invariably suffer from limitations. First, we only examine representative implementations of valuation models, applied by prior research. Heterogeneity in analysts' information processing and valuation heuristics may induce measurement error in the relative reliability of implied cost of equity. Second, our ex post CSR deviation is an imperfect measure for the ex ante CSR deviation that will directly distort the firm valuation. Third, our approach uses the association between the implied cost of equity and risk proxies as the metric for the reliability of the implied cost of equity. An implicit assumption is that considered risk proxies represent the full list of the 'true' risk factors. Omitted, correlated risk proxies may

affect our results. Finally, due to data limitations, we consider only seven developed countries. Therefore, our findings need not generalise to a larger cross-section of countries. Despite these caveats, we believe that our findings offer insights into the derivation of the implied cost of equity closer to the true, unobservable expected cost of equity. We leave for future research whether other accounting attributes, including accounting conservatism, affect the implied cost of equity and its estimation.

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Appendix

In this Appendix we prove the claim in footnote 2 that ex post clean surplus deviations should not affect the infinite horizon empirical implementation of the RIV model.

Denote the most recently observed historical book value by bv_t , and analyst earnings forecasts by $eps_{t+1}, eps_{t+2}, \dots$. The book value includes retained earnings which are the accumulation of earnings (or comprehensive income) from all prior years less the accumulated dividends. Consider what would happen if analysts, for the purpose of forecasting future earnings, apply a different definition or standard of earnings than that applied by the firm in prior years. Let bv_t^a denote the accounting book value that would have been reported in the initial year t if the firm had applied the analysts' definition of earnings. This creates an initial discrepancy, $\Delta bv = bv_t - bv_t^a$, in the application by empirical researchers of historical book value, bv_t , and analyst earnings forecasts. Since empirically, future book values are created by rolling forward through the clean surplus relation, all future book values will be misstated by the exact same amount, that is, $\Delta bv = bv_{t+n} - bv_{t+n}^a$. However, this potential measurement error rinses out in the valuation of the firm since:

$$\begin{aligned} & bv_t + \frac{(eps_{t+1} - r \cdot bv_t)}{(1+r)} + \frac{(eps_{t+2} - r \cdot bv_{t+1})}{(1+r)^2} + \frac{(eps_{t+3} - r \cdot bv_{t+2})}{(1+r)^3} + \dots \\ &= (bv_t^a + \Delta bv) + \frac{(eps_{t+1} - r(bv_t^a + \Delta bv))}{(1+r)} + \frac{(eps_{t+2} - r(bv_{t+1}^a + \Delta bv))}{(1+r)^2} + \frac{(eps_{t+3} - r(bv_{t+2}^a + \Delta bv))}{(1+r)^3} + \dots \\ &= bv_t^a + \frac{(eps_{t+1} - r \cdot bv_t^a)}{(1+r)} + \frac{(eps_{t+2} - r \cdot bv_{t+1}^a)}{(1+r)^2} + \frac{(eps_{t+3} - r \cdot bv_{t+2}^a)}{(1+r)^3} + \dots \end{aligned}$$

where the last equality follows from the identity that

$$0 = \Delta bv - r \left\{ \frac{\Delta bv}{(1+r)} + \frac{\Delta bv}{(1+r)^2} + \frac{\Delta bv}{(1+r)^3} + \dots \right\}.$$

This completes our proof. Note that this does not rule out that ex ante clean surplus deviations may affect the empirical implementation of the RIV model.

Discussion of 'Implied cost of equity capital in earnings-based valuation: international evidence'

Marco Trombetta*

1. Introduction

The paper by Chen, Jorgensen and Yoo (CJY) deals with a popular topic in the recent accounting and capital markets literature: the estimation of the cost of equity capital using analysts' forecasts as proxies for market expectations. The basic research question of the paper is the following: among a set of possible alternatives, which estimate is the best proxy for the unobservable ex-ante cost of equity capital?

According to the authors the paper provide two innovative contributions to the existing literature. First the empirical tests use an international database covering seven different countries. The authors claim that analysts in different countries may use different valuation models and, more generally, that economic and regulatory conditions may differ from country to country. These differences may affect the relative performance of different estimates of the implied cost of equity capital and only the use of an international database can control for these factors.

The second innovative contribution of the paper, according to the authors, is the use of the violation of the Clean Surplus Relation (CSR) as a potential candidate to explain the different performance of the various cost of capital estimates in the different countries. This is certainly one of the strongest points of the paper.

This discussion is organised in three parts. First, I address the issue of which model do analysts use to value companies. Then I move to the comparison of the relative performance of different estimates of the implied cost of equity capital. Finally, I comment on the use of CSR violations as a criterion to choose among these alternative estimates.

2. What valuation models do analysts use?

Company valuation is both one of the main tasks of any analysts and one of the main topics of any undergraduate or graduate educational programme in finance and/or accounting. Hence it is of crucial importance to understand if the models developed and taught by academics are actually used by the practitioners.

The kind of training that financial analysts are likely to receive around the world is probably fairly similar, especially if we focus on those countries with a significantly important stock market. Moreover the globalisation of capital markets and investment strategies calls into question the assumption that financial analysis is a national activity. Both these factors go against the suggestion made in the paper that analysts may use different valuation models in the seven countries covered in the paper.

Three recent studies have dealt with the issue of what models are actually used by analysts: Barker (1999), Demirakos et al. (2003) and Asquith et al. (2004). All these studies agree on the fact that multi-period discounted valuation models do not seem to play a significant role in analysts' normal valuation activity. Simple price-earnings multiples seem to be the predominant technique. Hence any cost of equity capital estimate that is based on a multi-period discounted valuation model may not be an adequate representation of the reality of valuation.

Williams (1995) survey on models of market expectations of earnings concluded by saying that the way in which markets form expectations was still far from being fully understood. It is probably fair to say that a few years later we are still far from knowing how expectations are formed in the market. Hence any estimate of the implied cost of equity capital based on some proxy of market expectations is bound to be a fairly poor description of the 'real' valuation process that generates the final market price. I believe that empirical re-

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search could aim for the simpler objective of finding a good proxy that can be used in studying the relationship between the cost of equity capital and some other factors such as, for example, disclosure, legal environment, risk, etc.

3. The choice among alternatives proxies of the implied cost of equity capital

In order to estimate an implied cost of equity capital the procedure to follow is the following. First, a valuation model has to be chosen. Then some simplifying assumptions have to be made in order to reduce the infinite horizon structure of the theoretical model to a tractable finite horizon model. At this point, analysts' forecasts are used as empirical proxies for the market expectation of future earnings. Finally the implied cost of equity capital is calculated as the discount rate that equates the value predicted by the model to the actual stock price.

Depending on the valuation model chosen and/or on the assumptions made in order to move from the infinite horizon to the finite horizon, the estimate of the implied cost of equity capital may vary. This is the reason why few recent papers have addressed the question of which is the best estimate. The paper under discussion belongs to this strand of literature.

3.1. The ranking criterion

The criterion used by CJY in order to rank the alternative estimates is the magnitude of the R^2 of a regression of the cost of capital estimate on a set of representative risk proxies. As the authors correctly point out, this methodology is consistent with some of the existing literature. However, this consideration does not guarantee that the criterion is a good one. There are two reasons why we could question this ranking criterion.

First, the list of risk proxies used may not be complete. If this is the case, then the R^2 ranking is valid only for that particular list of risk proxies. Given that CJY are consistent in the choice of proxies for each country and for the whole study, their rankings are certainly valid for the set of risk proxies chosen.

However it could be the case that some relevant risk proxy is omitted. If an additional explanatory variable is added as a risk proxy and this additional variable is statistically significant and has a different degree of correlation with the alternative estimates of the cost of equity capital, then the R^2 ranking may change. CJY report that their results are robust to the inclusion of the book-to-market ratio as an additional risk proxy, but there may be other possible candidates. The authors are aware of this limitation of their ranking criterion, because they mention it in the conclusions. However, recognising it explicitly does not make the limita-

tion less severe.

Second, even if the differences between the R^2 of the regressions are statistically significant, they may be not material. Let us consider Canada, for example. According to Table 5 panel B of the paper, the difference between the R^2 of the OJ regression and the R^2 of the RIVC regression is significant at the 1% level. However according to Table 5 panel A, for Canada the R^2 of the OJ regression is 0.14 and the R^2 of the RIVC regression is 0.21. It seems justified to question the materiality of such a difference. Moreover for three countries (France, Germany and the UK) out of seven most of the differences between the R^2 of the various regressions are not statistically significant.

3.2. Does it really matter?

If we abandon the idea of being able to 'represent' the real valuation process and we aim for the simpler objective described before (i.e., the study of the relationship between the cost of equity capital and some other variable), then we have to ask whether our results would be significantly different depending on the estimate used.

At first we can address this issue by performing a correlation analysis of the different cost of equity capital estimates. In the paper this is done in Table 4. For each of the seven countries each of the four estimates is positively correlated with each of the three alternatives. Moreover this correlation is always significant at the 1% level. Botosan and Plumlee (2002), Guay et al. (2003) and Hail and Leuz (2003) all report similar results. The results of this preliminary correlation analysis indicate that the choice of a particular estimate may not be so relevant.

Second, we can check if the signs of the coefficients of, for example, the regression of the cost of equity capital estimate on the risk proxies depend on the particular estimate used. Table 5 panel A of CJY report the 28 average coefficients for each of the explanatory variables. Table 1 presents the number of times that the average coefficient of a particular variable has a particular sign. The number within brackets is the number of 'minority' sign coefficients that have a t -stat greater than |1.65|. For only two of the five risk proxies there is evidence of some statistically significant difference in the sign between the 28 average coefficients. Moreover, this affects only four of the 28 estimated coefficients. Botosan and Plumlee (2002) and Guay et al. (2003) again have fairly similar results.

These numbers can be used as further evidence that the choice of the particular estimate is not so relevant. If the CJY paper had been a study on the determinants of the implied cost of equity capital, the qualitative results of the study would have been almost unaffected by the choice of the particular estimate used.

Table 1
Differences in sign for the 28 average estimates of Table 5 Panel A of CJY

<i>Sign</i>	<i>BETA</i>		<i>MV</i>		<i>D/M</i>		<i>EPS DISP</i>		<i>IDRISK</i>		
	Positive	28	100%	3 (0)	11% (0%)	28	100%	21	75%	17	61%
Negative	0	0%	25	89%	0	0%	7 (4)	25% (14%)	11 (4)	39% (14%)	
Total		28	100%	28	100%	28	100%	28	100%	28	100%

Finally, Asquith et al. (2004) show that the market reaction to analysts' reports does not depend on the valuation methodology used. This confirms the idea that the choice of the particular valuation model used to compute the ex-ante cost of equity capital is not so crucial.

3.3. Alternative criteria of choice

Even if the choice of a particular estimate may be not so material, the researcher is still left with the problem of making a choice.

One possible criterion can be the theory on which a particular estimate is based. If the researcher believes that one of the possible valuation models is better than the alternatives and/or that the assumptions used to make the model empirically tractable are more acceptable than the alternatives, then this criterion can be used to choose the estimate. Obviously, he/she will have to defend his position as objectively as possible.

A more pragmatic criterion can be the amount of data required to calculate a particular estimate. If we accept that the choice of the estimate is not so relevant, then there is no reason why we could not use the estimate that is easier to calculate.

Leuz and Hail (2003) also use an international database to calculate estimates of the ex-ante cost of equity capital obtained by using analysts' forecasts. Their aim is to test whether a specific country legal environment affects the cost of equity capital and they are not interested in the relative performance of different estimates. For this reason they decide to take the average across some possible alternatives.

Finally, Guay et al. (2003) use the correlation with future returns as their criterion.

4. The CSR violations criterion

I consider the analysis of CSR ex-post violations in an international context as the strongest point of the paper. CJY found that CSR ex-post violations are more pronounced in France, Germany and the United Kingdom than in the remaining four countries. Consistent with this finding, the implied cost of equity capital estimate that seems to work better in these three countries is the one based on the

Ohlson and Juttner-Nauroth (2000) model that does not require the CSR to hold. These results suggest that CSR violations can be used as the criterion to use in order to choose a particular estimate for a particular country.

However, in accordance with the arguments provided in the previous sections, I believe that this criterion should be viewed more as a possible methodological guide than an empirical fact. If the researcher believes that in a certain country CSR does not hold, then he/she can use this argument to use an implied cost of capital estimate that is derived from a model that does not require CSR to hold. There is no guarantee that the model will be a good description of the real valuation process or that the results would have been different had an alternative measure been chosen. But at least the piece of research will be logically consistent. In other words, if we have to choose one of the possible alternatives because, for example, the use of an average would be too costly in terms of time and data, then CSR ex-post violations can be used as a 'stylised fact' that supports one estimate with respect to the alternatives.

5. Conclusion

The analysis performed by CJY is useful because it extends to the international level the study of the properties of different estimates of the ex-ante implied cost of equity capital. It also provides us with an interesting comparison at the international level of possible violations of the clean surplus relation.

My reading of their results is that, consistent with what had already shown for US samples, the choice of the particular estimate of the ex-ante implied cost of equity capital is not likely to be particularly relevant when this is used simply as a proxy for the unknown true value. They all seem to perform in a fairly similar manner.

However, these ex-ante estimates are full of limitations as correct estimates of the real cost of equity capital. In this sense it is still unclear that they are necessarily superior to the more traditional ex-post estimates. Hence we are still left with the task of finding a better way to estimate the *real* cost of equity capital.

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Predicting firm value: the superiority of *q*-theory over residual income

Miles B. Gietzmann and Adam Ostaszewski*

Abstract—One of the contributions of residual income theory is that it establishes an equivalence between valuation of a firm based upon a discounted stream of future dividends and valuation based on accounting data in which book value and a discounted stream of future residual incomes take centre stage. However, this equivalence result is non-unique: residual income is only one of many income measures for which equivalence can be shown to hold. Given this non-uniqueness, the traditional residual income equivalence result provides at best a weak defence for the necessity of accounting via residual income. The principal objective of the current paper is to address this central limitation of existing research. We consider how to move on from dependence on equivalence as a weak defence for accounting-based valuation, to a framework in which strict preference between alternative valuation methods is possible. The principal reason why previous research has not considered such issues is because it has lacked an underlying microeconomic theory of managerial choice providing a framework within which to rank alternative valuation rules. From first principles we develop a dynamic optimisation model of managerial choice that provides the benchmark by which we can objectively appraise valuation based upon residual and other income measures. We show that hysteresis (non-uniqueness of valuation) can typically arise for residual income, whereas in contrast for the *q*-theory based income measure which we derive, valuation is, as expected intuitively, increasing in income (under some mild regularity conditions). Furthermore, we show how our proposed *q*-theory income measure could be estimated empirically and that our model provides an explanation for some of the apparent anomalies in the Burgstahler-Dichev empirical findings.

1. Introduction

Traditional finance-based models of firm valuation give centre stage to the role of discounted future dividend streams. When adopting such an approach the role of accounting in valuation may seem at most one of peripheral concern. However, the class of accounting models which are often referred to as the Ohlson residual income models provide accounting researchers with an alternative perspective since the approach takes advantage of the equivalence between valuation based upon discounted dividend streams and valuation based upon book values and discounted residual income streams. However, it is important to recognise that following a well-established line of criticism (Peasnell, 1982) the residual income approach of the clean surplus class of models, does not give rise to any structural implications for the application of accounting rules. Moreover, it is also well

known that the residual income/dividend-based equivalence result is not the only equivalence: there are many other income measures which generate equivalence to dividend based valuation.

The aim of this research is to move on from the many forms of equivalence type results and propose a model framework within which one can in principle choose between income measures. Our view is that establishing equivalence with dividend valuation is simply not enough: we wish to facilitate a programme of research which makes it possible to choose between various equivalent income measures according to some criteria. The main reason for adopting this approach is that we suggest it may shed light on the underlying theoretical rational for the details of accrual accounting practice. We stress that at this initial point our principal objective is to develop a framework in which rational choice between various measures is meaningful rather than to provide an actual ranking.

To a reader new to the field it may seem surprising that formal models choosing between alternative valuation approaches are not in active use in accounting research. In our view, this has arisen because for the equivalence type approach as applied in the realm of residual income models, the objective has traditionally been to show how under manipulation of the equivalence relationship, various variables with a clear accounting interpretation naturally arise in (equivalent) accounting-based valuations. However a decision-theoretic approach is not embraced, so even

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though the equivalence of valuation is shown to hold, we are never quite sure formally for what objective the accounting valuations are being collected. Simply stating that everyone knows valuation is critical for economic agents in financial markets is not a sufficient defence; there is an enormous gap between what a model captures and the reasons why valuation is important in the market place. Existence of equivalence should not be used as an excuse/defence for ignoring consideration of the microeconomic foundations of valuation practice.

We develop a microeconomic model of optimal dynamic managerial investment. Via dynamic programming we are able to identify the optimal expected value function for a candidate firm and this provides us with an unambiguous view concerning what constitutes correct valuation. In addition, we argue that due to information asymmetries, investors will not have sufficient access to information to determine the optimal value function and so may turn to the class of (dividend-based) equivalent income measures upon which to condition estimates of value. Thus in principle we can analyse the performance of various income-based valuation models relative to the underlying optimal value.

We tentatively commence research on choice between equivalent income measures by adopting what is best viewed as an illustrative property which investors may desire from an income measure. Specifically, assume investors want to be sure that greater income measure implies a greater firm expected value function. Interestingly enough we can show that for this seemingly quite weak requirement residual income fails (in contrast to our q -theory-based notion of income). We view this distinctive property as illustrative rather than definitive, since given the firm microeconomic foundations which are our principal objective, alternative researchers may wish to explore the extent to which income measures satisfy other investor adopted requirements. That is, we suggest that our modelling framework allows one in principle to move on from the large set of potential equivalence results of the residual income approach to explicitly consider how various income measures perform according to investor initiated requirements.¹ Furthermore, so as not to excessively downplay the role of earlier residual income research, it is important to note that our model-based argument differs from the many informal arguments which purport to compare the properties of various accounting measures. Indeed, since such research and text book coverage typically does not

restrict attention to the class of dividend-based equivalent measures which was the original starting point of residual income valuation modelling.

The paper is organised as follows. In subsection 1.1 we introduce some standard notation and comment on the related literature. In subsection 1.2 we illustrate another equivalence result: that between current value residual income and discounted dividend valuation for contrast against the traditional residual income equivalence. Beyond illustrating the non-uniqueness of residual income the main point of presenting this approach is that it actually forms the most tractable basis for understanding our dynamic optimisation model.

In Section 2 we introduce our microeconomic model of optimal managerial investment. Referencing the real options literature we show that the traditional net present value rule needs to incorporate embedded put and call option valuation in order to accurately value alternative investment possibilities. Using dynamic programming and a Cobb-Douglas returns technology we develop closed form solutions for the optimal value function, which permits us to be precise concerning the macroeconomic value of the firm. We also show how one can interpret the general optimal value function within Tobin's q -theoretic income framework. In particular, our model shows via equation (26) how one can view (optimal) equity value as comprising opening cash, q -re-valued opening stock, current q -income and future q -income. In Section 3 we explore the relationship between residual income and the underlying optimal investment value of the firm. We find that the relationship is characterised by hysteresis which means valuation on the basis of residual income can be non-univalent. We also state a Theorem (subject to a mild regularity condition) which establishes that this does not arise for valuation based upon q -income. Given in general the differing valuation implications of the two income measures we identify in subsection 3.2 a special case under which difference would not occur. It is instructive to see that this condition effectively requires removal of uncertainty from the problem and highlights from another perspective the inherent limitations of the static investment model underlying the residual income model linked to an AR(1) process. In Section 4 we present concluding comments.

1.1. Real options and the Feltham-Ohlson model

There exist a number of review papers of the Ohlson (1995) and related residual income approaches, such as Lo and Lys (2000) and Walker (1997), which thoroughly review the model and provide critiques of the approach. However, having subjected the model to a critique, those papers do not provide constructive alternative valuation approaches. In contrast, we try to mount a con-

¹ Clearly, an ultimate objective would be for these requirements to be chosen rationally within a general equilibrium framework of investment choice.

structive response to the identified limitations of the residual income approach by developing a new model designed to overcome the lack of a well-defined role for management with respect to project selection. In the following sections we derive a valuation model in which management has a role to play via real options in project selection.²

The Ohlson model is normally developed by first recalling a well-known transformation of the traditional discounted future dividend valuation model:

$$\sum_{t=1}^{\infty} \gamma^t E_t(d_{t+\tau}) \quad (1)$$

at date t , where d_t = dividends paid at the end of each period t , $\gamma = (1 + r)^{-1}$ and r is an appropriate rate of return, and E_t = the expectations operator. Before considering the transformation, there are two natural interpretations of (1). The first has expectations computed using an equivalent martingale measure for the equity price (a modelling assumption is that such exists on the grounds of no arbitrage opportunities), and then the rate of return r is interpreted as the riskless rate. Alternatively, if the returns on equity W_t are modelled as independently and identically distributed (i.i.d.; assuming such a belief on the part of investors), then the physical probability for the distribution of equity price may be used as an equivalent procedure, in which case the rate of return becomes the constant expected rate of return, and that of necessity is set equal to the 'required rate of return' for the given class of risk. Our model is based on the latter premise; that is to say, the model assumes that management control economic activities so that expected return is set equal to the required rate of return. The study of such settings through identification of embedded investment call and put options is standard in the real-options approach to investment.

Equation (1) requires a technical assumption³ (here regarded as a mild regularity assumption).

From this equation, and also subject to a similar kind of technicality,⁴ appeal to the so-called clean surplus identity

$$B_t = B_{t-1} + y_t - d_t, \quad (2)$$

where B_t = book value of equity at t , y_t earnings at the end of period t (before dividend) leads to the **residual income identity**:

$$S_t = \text{Equity value at time } t = B_t + \sum_{\tau=1}^{\infty} \gamma^\tau E_t(\hat{y}_{t+\tau}), \quad (3)$$

where residual income, or abnormal earnings as it is alternatively called, is defined by

$$\hat{y}_t \equiv y_t - rB_{t-1}.$$

(We do not study the dirty surplus variant which seeks to isolate exceptional items from earnings proper.) The most attractive feature of this approach is that it links valuation to (observable) accounting data. The ability to re-express (1) in a way that gives accounting data centre stage via (3) has been well-known for a considerable time. Ohlson's particular contribution was to set out a specific proposal for how $\hat{y}_{t+\tau}$ evolves. In particular he posited that

$$\hat{y}_{t+1} = \omega \hat{y}_t + x_t + \varepsilon_{t+1}, \quad (4)$$

where $0 \leq \omega$, x_t = value relevant information not yet included in the accounting data⁵ and ε_{t+1} is a zero-mean disturbance term. In turn he assumed

$$x_{t+1} = gx_t + \eta_{t+1}, \quad (5)$$

where $g < 1$ and η_{t+1} is a zero-mean disturbance term. Together (4) and (5) imply that abnormal (residual) earnings follow an AR(1) process. It is apparent immediately that the Ohlson approach presents an opaque model of management, since nowhere does the Ohlson model consider managerial project selection or opportunities. Similarly, the Feltham-Ohlson (FO) extension, which allows for conservative accruals, is silent with respect to project opportunities and the real options that these create. Thus, while the FO approach does establish a dependence of abnormal earnings on book value, it does so via a simple (decision opaque) mechanistic formulation. Lo and Lys (2000) pick up this point and comment in detail on links with the Gordon dividend growth model, pointing out that the assumption of an AR(1) process, although perhaps viewed initially as quite benign, implies very real restrictions on the economic settings in which the FO model can justifiably be applied.

Remark 1: The Feltham-Ohlson class of models is not well suited to applications where firms adopt flexible investment strategies. One of our

² To the best of our knowledge only two other authors consider a similar modelling approach. Yee (2000) also incorporates project selection but in a very different way from our model. In Yee, firms facing poor returns can switch out of existing projects as other exogenous projects are available. By contrast, in our model we are concerned with the expansion and contraction path of an **investment in place**, that is, the firm does not completely abandon a project when things are bad, they first need to manage a contraction or later expansion on an ongoing basis. The other paper, much closer to ours in spirit, is Zhang (2000) which is discussed at the end of the subsection.

³ The no bursting bubble assumption $\gamma^t E_t[W_\tau] \rightarrow 0$ as $\tau \rightarrow \infty$, is required here.

⁴ Namely: $\gamma^t B_t \rightarrow 0$ as $\tau \rightarrow \infty$, i.e. book value does not grow faster than the riskless or required rate of return (whichever is appropriate).

⁵ In our model we do not explicitly model this quantity.

principal objectives is to derive an alternative model framework which puts at centre stage a valuation model based upon firm's period-by-period decisions on whether or not to expand, contract or maintain investment.

That is, a significant limitation of the FO approach is that it is essentially a static theory of investment in which once management make an investment they implicitly ignore the type of strategic new investments and divestments opportunities that typically characterise the rich empirical setting in which investment decisions are taken in practice. A central part of our model will be to identify a firm's optimal dynamic investment strategy. That is, in our model we will consider how management dynamically adjust their investment strategy in response to time-varying stochastic conditions. We suggest that our model provides a more natural foundation upon which to structure empirical observations of firms that routinely switch between contracting, shutting down, maintaining or expanding investment projects.

Remark 2: We show that an alternative accounting measure also provides an equivalence to valuation resulting from discounting dividend streams as in (1), and furthermore that this alternative measure has a desirable monotonicity feature.

Furthermore, we shall later argue that because of the decision-opaque nature of the FO approach, it is under-specified in terms of what role informational asymmetries are being assumed, if any. When the possibility for asymmetries is allowed for, we then suggest one imposes⁶ a regularity requirement which provides a simple test for what seems to be a reasonable property for an accruals system, namely, that when using an income measure to predict future firm value there exists a functional relationship between the two. We show the FO residual income model may fail this test, and

so fails to be a satisfactory measure upon which to condition forecasts of future firm value. Again anticipating an argument that will be made more formally in subsequent sections, this arises because we can show how the FO measure is subject to hysteresis effects. Specifically, we show that given the same level of FO residual income \hat{y}_t for two firms, the prediction of optimal future firm value must be conditioned upon whether the firm is expanding or contracting its investment set. That is, if one firm is expanding while the other is contracting, even though the residual income figures are identical,⁷ our theory predicts that different valuations be attached to the respective firms. Put differently, simple linear extrapolation of future firm value based upon current residual income omits important features central to characterizing the empirical nature of firms' investment settings.

The approach of Zhang (2000) also considers how to revise the FO approach to include real option effects. In that respect the initial starting point of his approach and ours is identical. However, the Zhang model is essentially a one shot model in which firms only ever once decide whether to expand, maintain or contract investment.⁸ That is, after the one time decision they are thereafter locked in by that decision. In contrast, our model is dynamic in the sense that for instance in three successive periods a firm may expand, contract and then maintain investment level. On the surface one may at first believe that the Zhang approach, although offering a simplification, may be able to capture most of the essential pertinent features of investment behaviour. However, since the model is essentially one shot, empirical issues of coping with over- or under-investment inherited from the previous periods are not captured, that is, the Zhang model is not history dependent. We develop a model that is history dependent in the sense that we introduce an additional variable, opening capital stock, use of which management needs to optimise given stochastic input prices. In contrast the Zhang approach depends only upon a stochastic efficiency factor (which partly mirrors our price variable) while capital stock levels change according to a simple exogenous assumption.

Thus, at its simplest our model is a two-state variable investment model (a stochastic price or efficiency parameter, and a history dependent opening investment stock parameter) whereas the Zhang model considers only the first of these two state variables. In terms of empirical implications our model potentially provides an explanation for why two firms which, according to the Zhang model, would both expand investment may be seen to adopt differing strategies like maintenance and expansion respectively given that one of them had over-invested in the previous period. That is, our approach allows a richer empirical model to be

⁶ In later sections we shall provide a preliminary consideration of the issue of what constitutes a good accounting accruals measurement system. At this stage we are just highlighting that our methodology can at least lead to some discrimination between alternative accruals processes, unlike FO. We stress that we are not claiming to be in a position to identify optimality of accruals measurement, simply that we can provide a partial ranking absent among (dividend-based) equivalent measures under the FO approach.

⁷ The informal intuition is as follows. Two firms could have the same residual income, with one firm making high revenues and expanding (purchasing) significant additional amounts of capital, while the other firm has lower current level revenues attributable to production but can achieve the same overall residual income figure by contracting/running down capital stocks.

⁸ Zhang (2000) makes this point clearly in the text arguing that the assumptions are made to insure tractability. Hence one of our contributions is to maintain tractability for a more realistic investment setting in which firms vary their investment strategies through time.

fitted to data⁹ in which capital stocks, as well as efficiency (or price variability), have an important explanatory effect.

In order to give an initial flavour¹⁰ of our approach, we will introduce a simple two-period model which illustrates how we choose to account for values in our general model setting. We demonstrate equivalence of this current value based measure with the traditional residual income measure. This is also to reiterate the point made in the introduction that the traditional discounted dividend stream equivalence with discounted residual income measure is a non-unique result.

1.2. An example of equivalence with a disaggregating measure of residual income

We motivate our discussion by a simple two period model.¹¹ The returns technology will be assumed to follow a Cobb-Douglas function and for illustration we will always take the simple square-root formulation; thus the period profit from applying x units of capital into production gives the firm a return in the convenient form $2\sqrt{x}$ (and consumes the input x). From this return the purchase cost of the capital p_0x needs to be deducted in order to determine profit. In this subsection we shall assume that the firm chooses to commence at $t = 0$ with $x + u$ units of capital purchased at p_0 a unit,¹² plans to use x of the units in the first period and stores the remaining u units as a hedge for the second period's activity.¹³ We write the accounts for the scenario in which the firm's second period decision is to commit the stock u into production without expanding or contracting the stock. Thus:

$$\text{opening net assets } B_0 = p_0(u + x).$$

⁹ Another important difference between our approaches is that rather than our focus upon dynamic optimisation, Zhang's focus is upon the links between valuation and 'arbitrarily' biased accounting numbers.

¹⁰ Although the difference presented in the subsection below may be considered by some readers as small, we actually introduce a far more significant change in emphasis on income measures away from the traditional residual income focus in Sections 2 and 3.

¹¹ This initial model is presented for pedagogic purposes. Many of the most interesting dynamic features are absent so as to first alert the reader's attention to pure accounting valuation issues before formally considering the investment optimality dynamics (which complicate the analysis, but adds important empirical richness to the setting).

¹² Assume this is financed by the owner's initial equity investment.

¹³ Clearly one of the tasks of subsequent sections will be to show when this is optimal and when it is not, to identify the optimal policy. The intuition concerning the hedge here is that assuming the future price of the stock is expected to increase, the fact that the price is stochastic means there is an economic value associated with not committing to purchase all resource needs in advance. Indeed, the fact that prices could fall as well as rise leads to some value of waiting.

¹⁴ This is because of the temporarily applied simplifying assumption of a deterministic rise in prices by a factor of $(1 + r)$.

We compute the two periods' respective earnings and residual incomes under the historic cost convention as:

$$\begin{aligned} B_1 &= 2\sqrt{x} + p_0u & B_2 &= (1+r)2\sqrt{x} + 2\sqrt{u} \\ B_1 - B_0 &= y_1 & B_2 - B_1 &= y_2 \\ y_1 &= 2\sqrt{x} - p_0u & y_2 &= 2\sqrt{u} - p_0u + 2\sqrt{xr} \\ \hat{y}_1 &= y_1 - rp_0(u+x) & \hat{y}_2 &= y_2 - r(2\sqrt{x} + p_0u) \\ \hat{y}_1 &= 2\sqrt{x} - (1+r)p_0x - rp_0u & \hat{y}_2 &= 2\sqrt{u} - (1+r)p_0u. \end{aligned}$$

Note that the revenue $2\sqrt{x}$ included in B_1 is assumed to arise at the end of the first period (i.e. time $t = 1$) for discounting purposes. Since we will want to show valuation equivalence with another method of calculating residual income, we note that under the above historic cost assumptions the value of the firm at time $t = 0$ is given by opening book value plus the sum of discounted (historical) residual incomes:

$$\begin{aligned} B_0 + \frac{\hat{y}_1}{1+r} + \frac{\hat{y}_2}{(1+r)^2} \\ = p_0(u+x) + \frac{2\sqrt{x} - (1+r)p_0x - rp_0u}{1+r} + \frac{2\sqrt{u} - (1+r)p_0u}{(1+r)^2} \\ = p_0u + \frac{2\sqrt{x} - rp_0u}{1+r} + \frac{2\sqrt{u} - (1+r)p_0u}{(1+r)^2} \\ = \frac{2\sqrt{x}}{1+r} + \frac{2\sqrt{u}}{(1+r)^2}. \end{aligned}$$

Finally the key thing to note from this simple example is that during intermediate periods (e.g. $t = 1$), calculating residual income requires one to keep track of both investment stock used up in the period (x) and investment stock carried forward (u) for future use in some other period, that is:

$$\hat{y}_1 = 2\sqrt{x} - (1+r)p_0x - rp_0u, \quad \hat{y}_2 = 2\sqrt{u} - (1+r)p_0u. \quad (6)$$

Now in contrast, rather than track historic-cost accounting income, as in the FO framework, we shall instead track current-value accounting income adding an adjustment for *per-period holding gains* denoted HG (we include both realised and unrealised gains). That is, we shall assume that any physical stock u valued at V which remains unused during a period is valued at $V(1+r)$ at the end, just as with any (banked) cash receipts generated in the previous period.¹⁴ Thus let us define current value accounting income that incorporates holding gains as:

$$y_t^{CV} = (B_t + HG_t) - (B_{t-1} + HG_{t-1}) + d_t, \quad (7)$$

$$= B_t^{CV} - B_{t-1}^{CV} + d_t, \quad (8)$$

and

$$\hat{y}_t^{CV} = y_t^{CV} - rB_{t-1}^{CV} \text{ where } B_t^{CV} = B_t + HG_t.$$

For our setting above, the current-value accounting values¹⁵ are given by:

$$\begin{aligned} HG_1 &= r \cdot p_0 u & HG_2 &= 2r\sqrt{x} \\ B_1^{CV} &= 2\sqrt{x} + p_0 u(1+r) & B_2^{CV} &= (1+r)2\sqrt{x} + 2\sqrt{u} \\ B_1^{CV} - B_0^{CV} &= y_1^{CV} & B_2^{CV} - B_1^{CV} &= y_2^{CV} \\ y_1^{CV} &= 2\sqrt{x} - p_0 x + p_0 u r & y_2^{CV} &= 2\sqrt{u} - p_0 u(1+r) + 2\sqrt{x} r \\ \bar{y}_1^{CV} &= y_1^{CV} - rp_0(u+x) & \bar{y}_2^{CV} &= y_2^{CV} - r(2\sqrt{x} + p_0 u(1+r)) \\ &= 2\sqrt{x} - (1+r)p_0 x & &= 2\sqrt{u} - (1+r)^2 p_0 u. \end{aligned}$$

Next we note that, under the above current-value cost assumptions, the value of the firm at time $t = 0$ is given by opening book value plus the sum of discounted (current-value) residual incomes, which is identical to the above valuation with pure historic costs:

$$\begin{aligned} B_0 + \frac{\bar{y}_1^{CV}}{1+r} + \frac{\bar{y}_2^{CV}}{(1+r)^2} \\ = p_0(u+x) + \frac{2\sqrt{x} - (1+r)p_0 x}{1+r} + \frac{2\sqrt{u} - (1+r)^2 p_0 u}{(1+r)^2} \\ = \frac{2\sqrt{x}}{1+r} + \frac{2\sqrt{u}}{(1+r)^2} \\ = B_0 + \frac{\bar{y}_1}{1+r} + \frac{\bar{y}_2}{(1+r)^2} \end{aligned}$$

and thus from an investor-valuation perspective at $t = 0$ the two methods are equivalent. Now observe the form of the two current-value residual incomes:

$$\bar{y}_1^{CV} = 2\sqrt{x} - (1+r)p_0 x, \bar{y}_2^{CV} = 2\sqrt{u} - (1+r)^2 p_0 u.$$

Letting

$$b_i = (1+r)p_i x,$$

be the effective (end of period) prices, we see immediately that the current value residual incomes can simply be written as

$$\bar{y}_1^{CV} = 2\sqrt{x} - b_0 x, \bar{y}_2^{CV} = 2\sqrt{u} - b_1 u, \quad (9)$$

and hence unused stock in each period does not need to be included in the determination of current-value residual income as is the case in (6). It

¹⁵ It is important to point out that the first term HG_1 grows here by r^* only because of the temporarily applied simplifying assumption of determinism. In the general stochastic setting as considered from Section 2, HG_1 grows by reference to the stochastic nature of the environment (the investment asset input price process) and whether or not the firm is expanding or contracting as derived later in (25).

¹⁶ As with the earlier discussion in this section we are trying to maintain an element of intuitive informality before subsequently introducing formal technical arguments.

is important to recognise these expressions naturally lead to use of replacement-cost accounting. That is, given that we wish to consider whether at any point in time residual income is useful for predicting future firm value, we shall find it simpler to characterise future residual incomes in the current value convention as illustrated in (9).

Remark 3: Like the FO traditional historic cost residual income measure, our current-value residual income measure (which generalises to q -income) is equivalent to the discounted dividend stream.

Remark 4: Comparing \bar{y}_1^{CV} to \bar{y}_1 it is apparent that, whereas the latter income measure depends functionally on both current usage x of the stock of the investment asset, and the level of stock carried forward u , the current value income measure depends only upon the current usage x which we refer to as the disaggregation feature of current value residual income.

Having shown an alternative equivalent decomposition of accounting income which has an appealing modelling feature, we next return to the issue of the AR(1) process that FO employ. The reason why FO make this assumption in their model is because they need some method to predict how future residual income is generated. In contrast to their mechanistic formalisation, we assume that residual income results explicitly from firm-based microeconomic optimisation. In the dynamic investment setting that we will consider here, this corresponds to a requirement of solving for the **optimal value function** of the firm, which when added at any point in time to book-value with holding gains on stock (following a stochastic realisation of a parameter) **provides the appropriate valuation of the firm** conditional upon optimal decision-making.¹⁶ Thus, provided we can solve for the optimal value function, we can critically appraise the question concerning how well an accounting measure, such as residual income, performs at predicting firm value. Indeed, one can directly refer to the relationship between the accounting-based measure and the optimal value function.

Given that the identification of the optimal value function underpins our analysis, the following section is concerned with developing the optimisation procedures required to determine the optimal value function. Section 2 initially discusses a well-known general model which explains most succinctly why the implicit optimisation of traditional static investment analyses (referred to as naïve analysis), including in particular FO, is found to be deficient. The model shows that since the call and put options embedded in investment expansion and contraction options are omitted, these traditional approaches do not form the basis for identification of optimal investment decision-making.

Remark 5: Attempting to show empirically how FO residual income relates to expected firm value can be misguided because if managers actually used FO residual income to rank projects, this would imply an element of sub-optimisation on the part of managers.

We now develop our model of optimal (dynamic) investment behaviour.

2. Optimal investment by management: an endogenous regime-switching model of investment

The investment model closest in spirit to ours is the real options investment model developed by Abel, Dixit, Eberley and Pindyck (1996) – hereinafter referred to as ADEP – which presents an easily accessible introduction to the literature and clearly demonstrates the above-outlined limitation with the FO model.

2.1. The received paradigm

In a simple two-period setting the model considers the problem of whether a firm should add to or reduce its opening (first-period) stock of capital K_0 which is purchased at a unit price of b_0 . This is to be determined given the following three complications: the future (period one) purchase price of capital b_H may exceed its current price (costly expandability: $b_H > b_0$); the future resale price of capital b_L may be less than its current price (costly reversibility: $b_L < b_0$) and finally, second-period revenues from employing capital are stochastic. The stochastic element is introduced as follows.¹⁷ In the first period total revenue from installed capital is $r(K_0)$; in the second period the revenue, denoted $R(K, a)$ has a stochastic component determined by the realization of a . Subsequently in the second period after a has been revealed the firm adjusts the capital stock to a new optimal level denoted $K_1(a)$. Differentiating the revenue function with respect to K , the following two critical values of a are identified:

$$R_K(K_0, a_L) \equiv b_L \quad \text{and} \quad R_K(K_0, a_H) \equiv b_H.$$

That is, the optimal (marginal) decision rule is:

- when $a < a_L$ it is optimal to sell capital to the point that $R_K(K_1, a) = b_L$,
- when $a_L \leq a \leq a_H$ it is optimal to neither purchase nor sell capital, that is $K_1(a) = K_0$,
- when $a > a_H$ it is optimal to purchase capital until $R_K(K_1, a) = b_H$;

and so the present value of net cash flows $V(K_0)$ accruing to the firm commencing with capital stock K_0 in period zero with inter period discount rate γ is given by

$$\begin{aligned} V(K_0) = & r(K_0) + \gamma \int_{a_L}^{a_L} \{R(K_1(a), a) + b_L[K_0 \\ & - K_1(a)]\} dF(a) \\ & + \gamma \int_{a_L}^{a_H} R(K_0, a) dF(a) + \gamma \int_{a_H}^{\infty} \{R(K_1(a), a) \\ & - b_H[K_1(a) - K_0]\} dF(a). \end{aligned} \quad (10)$$

Thus the period-one decision faced by the firm is

$$K_0 = \arg \max V(K_0) - b_0 K_0,$$

and the Net Present Value Rule can be interpreted from the first-order condition as requiring

$$\begin{aligned} V'(K_0) \equiv & r'(K_0) + \gamma b_L F(a_L) \\ & + \gamma \int_{a_L}^{a_H} R'(K_0, a) dF(a) + \gamma b_H [1 - F(a_H)] \\ & = b_0. \end{aligned} \quad (11)$$

This equates the period-one and onwards marginal return to capital to the initial marginal cost; note that the terms after $r'(K_0)$ which take into account the optimal change in capital stock in the following period. An alternative interpretation is also available. ADEP point out that equation (11) can be interpreted using Tobin's q -theory of the marginal value of capital. In this instance the marginal value of capital is

$$q \equiv V'(K_0),$$

and so the optimal investment rule can be identified by management if they determine q .

With respect to implementing this rule ADEP (p.761) comment that this (theoretically correct) rule can be difficult to apply in practice because 'for a manager contemplating adding a unit of capital, it requires rational expectations of the path of the firm's marginal return to capital through the indefinite future' and thus in practice the most commonly used proxy for the correct NPV treats the marginal unit of capital installed in period 1 as if the capital stock is not going to change again. In this case the marginal value of $V'(K_0)$ is approximated by:

$$\hat{V}'(K_0) \equiv r'(K_0) + \gamma \int_{a_L}^{a_H} R_K(K_0, a) dF(a), \quad (12)$$

and ADEP describe this replacement for the left-hand side of (11) as yielding the *naive NPV rule*.

ADEP then proceed to show that the difference between $\hat{V}'(K_0)$ and $V'(K_0)$ is given precisely by the embedded put $P(K_0)$ and call options present in the problem. To summarise, in the first period

¹⁷ For brevity we are not including details of all the regularity conditions since they can be found in the original text.

optimality requires management to choose K_0 so that

$$\tilde{V}'(K_0) = b_0 - \gamma P'(K_0) + \gamma C'(K_0). \quad (13)$$

That is, under the naive rule in which management set $\tilde{V}(K_0) = b_0$, management are ignoring (strategic) option values to contract or expand in the second period and hence typically would choose K_1 sub-optimally.

Moreover it is straightforward to show¹⁸ that the FO model is an implementation of the naive investment rule which ignores the options to expand and contract available in most real-options settings, hence accounting valuation theory based upon that approach is unlikely to be able to capture how accounting valuation impinges upon the firm's actual dynamic investment strategy (including both expansion and contraction possibilities).

2.2. A critique of methodology

Our model specification is somewhat different from that of ADEP. Before concentrating on the differing interpretation over specific variables it is important to emphasise that our general methodological goal is also different. Whereas ADEP were able to identify general statements concerning the conditions that optimal investment strategy should satisfy and how that leads naturally to consider embedded put and call options, they did not actually characterise the functional form for the rewards from adopting an optimal investment strategy. In consequence their analysis is not of direct use when trying to assess whether an accounting measure does, or does not, allow users to predict (optimal) future firm value. We depart from their approach by introducing specific functional forms to characterise the basic investment setting with the hope of being able to identify how optimal future firm value depends parametrically upon decision variables that management control.

The following more technical subsections show that within our model specification we can in fact identify future firm value as the optimal value function for the dynamic investment strategy adopted by management, and that this takes a quite intuitive form.¹⁹

Remark 6: In our model setting, future firm value V_0 is given by the sum of expected future period-by-period (optimised) indirect profits, plus the valuation of the existing stock of

investment at its expected marginal value, which is consistent with q -theory.

Recalling the original Ohlson motivation for introducing an AR(1) process as dealing with the need to model how expectations evolve, it may at first seem that we too are now in exactly the same situation – needing to impose a model of how expectations, albeit of future firm profitability rather than residual income, evolve over time. Appreciation of how we respond to this point provides the critical conceptual distinction between our approach and that of FO. In particular, working with the indirect profit function²⁰ we are able to show in this section how the period t (indirect) profit is functionally determined by the most recent observed investment input price b_t . That is, we show that when attempting to form expectations upon future values of the indirect profit function, this requires expectations to be formed over how the stochastic input price b_t evolves. We state our assumption formally in equation (14) below. So have we simply replaced the FO, AR(1) assumption with just some other equally restrictive assumption? We would argue not, for the following reasons. Our distributional assumption is imposed upon an input price process which arises before any managerial action is taken. This is in contrast to Ohlson, who imposes a distributional assumption directly on the evolutionary path of residual income, and hence – as we have seen earlier – imposes very real constraints upon the implied investment settings where this could logically be assumed to have followed from rational managerial behaviour.

Expressed alternatively, we would argue that it is less restrictive to impose a distributional assumption on an input than it is to impose one upon an output that results from managerial actions being applied to inputs. To summarise, it is our contention that the necessary distributional assumption that needs to be applied to compute expectations in any model of future firm value, is applied at too late a stage in the model of managerial behaviour in the Ohlson approach. Applying the distributional assumption to expected residual income necessarily restricts attention to only a subset of real-world decision scenarios that management may face in practice. For instance, as our earlier discussion makes clear, the FO model simply does not apply in a setting where a firm has good and bad years. By contrast, in our model the ‘good’ or ‘bad’ realisations of the stochastic input price are at centre stage and the evaluation of the induced management’s performance is effectively in terms of an assessment of their ability to exercise correctly the embedded growth, maintenance, or contraction options that come ‘into the money’.

Having outlined methodologically what we wish

¹⁸ See Lo and Lys (2000). The FO approach simply assumes constant expansion (as in the Gordon growth model) rather than period-by-period expansion or contraction as will be allowed for in the model developed below.

¹⁹ The precise statement is given towards the end of this section by equation (21).

²⁰ See, for instance, Varian (1992) for a discussion of the use of the indirect profit function.

to achieve in general terms, let us now turn to the detailed specification. However, just before doing so, we draw the reader's attention to the fact that there exists a difference in our model and that of ADEP in the way in which capital is utilised. In particular we develop a model of (installed) capital in which capital depreciates through use (as directed by management), rather than at a constant rate, or not at all, as in the ADEP model. We make this assumption to allow for the possibility that the net book value of an investment asset after subtracting accumulated depreciation could in principle be equal to the economic value of the asset to the organisation. In contrast in the ADEP framework, the asset is assumed never to depreciate. In addition, we extend the investment planning horizon beyond a simple two-period framework to a general finite-horizon setting.

2.3. The model

In this subsection we develop a multi-period model of investment in a production setting. Each period (dated t_n) has an opening stock of inputs and a Cobb-Douglas function $f(x)$ determines the per period revenue obtained from applying an amount of input x_n , decided upon by management and there is both a selling and a buying price for inputs so that management may increase (expand) stock by buying at a price b_n , reduce (contract) stock by selling at a knocked-down price $\phi_n b_n$ (where $0 < \phi_n < 1$) which we refer to as the resale price (assumed known at the end of the previous period); the closing stock (i.e., unconsumed and unsold inputs) are stored at zero cost for future use. We reiterate the fact that (unlike in the ADEP model) inputs once applied to production are fully depreciated (unavailable for repeated use). Management take optimal decisions based on risk-neutrality; they seek to maximise expected present value of the profit stream and in pursuit of this aim have three possible courses of action (i.e. three options to exercise) alongside the consumption decision: to buy stock, to sell stock, to carry-forward existing stock.

Note that the two prices in each period are observed only by managers and not by external investors. Although in general we use a sequence of times and corresponding prices that evolve geometrically, the price is nevertheless presented as though it evolves continuously as a geometric Brownian motion. Such an approach is dictated purely by mathematical convenience; the mathematics of optimisation is much streamlined by the assumption that at each time, price is distributed continuously rather than multinomially; the presence of inter-period prices is not referred to in any way because we have periodic management decision making. The price b_t has positive constant drift (anticipated growth) $\mu_b > 0$, and is presented

in the traditional stochastic differential form:

$$db_t = b_t(\mu_b dt + \sigma_b dW_b(t)), \quad (14)$$

where $W_b(t)$ is a standard Wiener process. It is assumed that $\gamma\phi_1 e^{\mu} < 1$ and that $\gamma e^{\mu} > 1$, so that in each period the expected rise in input price is above the required return on capital and the resale price drops below this rate. For $t > s$, we let $Q(b_t | b_s)$ denote the (log-normal) cumulative distribution of b_t given b_s , and we also let $Q_n(b) = Q(b_{t_n} | b_{t_{n-1}} = 1)$ denote the (log-normal) cumulative distribution of $b_n = b_{t_n}$ given that $b_{t_{n-1}} = 1$. When the context permits, we drop the subscript n . The development of the model depends on the multiplicative nature of prices – the distribution of the ratio b_{t+1}/b_t is independent of b_t .

Our intuition is developed first within a two-period setting and we use an inductive argument to generalise to the multi-period setting. We will see that the unifying concepts for understanding the structure of profits under the three options of sell/hold/buy (i.e. of capital contraction/maintenance/expansion) are those of marginal-value costing and the corresponding holding gains/losses. The marginal value of currently buying an extra unit of resource is b , of selling is ϕb ; an intermediate price will describe the marginal value for carrying forward into the future in the maintained capital regime. Evidently the holding gains/losses are defined with respect to the difference between historic cost and marginal value.

2.4. Main characterisation theorems on optimal value generation

In this subsection we will prove the following theorem in the two-period setting; but the theorem remains true as stated in the multi-period case. Mutatis mutandis, it extends to all Cobb-Douglas functions provided b^{-2} is replaced by $G(b)$ where $G(\cdot)$ is the inverse function of $f'(\cdot)$.

The theorem refers to the Fenchel-Legendre dual function of $f(x)$ defined by:

$$f^*(x) = \text{def } f(x) - xf'(x).$$

It has a central role as explanatory variable in the two theorems below. Let us explain why this is so by reference to a one-period model in which a firm has a stock u purchased at a historic cost of h per unit. If the firm is under-invested and needs to expand the opening stock from u to an optimal level x^* where necessarily marginal value $f'(x^*)$ equals the purchase cost b , its profit will be $f(x^*) - hu - b(x^* - u)$, i.e.

$$f^*(x^*) + u(b - h),$$

which decomposes the profit into economic oper-

ating profit $f^*(x^*)$ and holding gains $u(b - h)$ as computed relative to replacement costs. Such a decomposition also holds when the firm is over-invested and seeks to reduce its stock u to a level x^* where marginal value $f(x^*)$ equals the resale price ϕb ; its profit will then be $f(x^*) - hu + \phi b(u - x^*)$ and this is again

$$f^*(x^*) + u(\phi b - h),$$

where the holding gains are relative to the resale value. If neither expansion nor contraction are optimal we may still decompose the profit $f(u) - hu$ in the same format, namely as

$$f^*(u) + u(f'(u) - h),$$

provided we compute holding gains this time by reference to the marginal value of u . The common format of all three expressions places the dual function in a special role. Our principle theme is thus that $f^*(x^*)$ is an explanatory variable. Indeed when $f(x) = x^\gamma$ we have

$$f^*(x^*) = (1 - \gamma)f(x),$$

so that $f^*(x^*)$ can be imputed from a knowledge of the revenue $f(x)$ once γ has been estimated. As will be seen below, the role of f^* is maintained in a multi-period setting. We first address the optimal behaviour of management.

Theorem 1 (Characterisation of optimal management given b)

In the case of the Cobb-Douglas returns technology $f(x) = 2\sqrt{x}$ there exist constants

$$x_n^*(1, \phi), \hat{u}_n(1, \phi), \hat{v}_n(1, \phi),$$

defined for $\phi \in \{1, \phi_n\}$, and there exist functions $\tilde{u}_n(\cdot), \tilde{R}_n(\cdot)$, such that with $\tilde{x}_n(w) = \text{def } w - \tilde{u}_n(w)$ optimal management is defined as follows. If the current price is b the optimal usage of production input and optimal carry-forward are given by:

$$x_n^*(b) = \begin{cases} \frac{x_n^*(1, 1)}{b^2} & \text{if } v \leq \frac{\hat{v}_n(1, 1)}{b^2}, \\ \frac{\tilde{x}_n(b^2 v)}{b^2} & \text{if } \frac{\hat{v}_n(1, 1)}{b^2} \leq v \leq \frac{\hat{v}_n(1, \phi_n)}{(\phi_n b)^2}, \\ \frac{x_n^*(1, \phi_n)}{b^2} & \text{if } v \geq \frac{\hat{v}_n(1, \phi_n)}{(\phi_n b)^2}. \end{cases}$$

$$u_n^*(b) = \begin{cases} \frac{\hat{u}_n(1)}{b^2} & \text{if } v \leq \frac{\hat{v}_n(1, 1)}{b^2}, \\ \frac{\tilde{x}_n(b^2 v)}{b^2} & \text{if } \frac{\hat{v}_n(1, 1)}{b^2} \leq v \leq \frac{\hat{v}_n(1, \phi_n)}{(\phi_n b)^2}, \\ \frac{\hat{u}_n(1, \phi_n)}{(\phi_n b)^2} & \text{if } v \geq \frac{\hat{v}_n(1, \phi_n)}{(\phi_n b)^2}, \end{cases}$$

and the future value, regarding \hat{u}_n^ as a sunk cost, is given by:*

$$V_n(u_n^*, b) = \begin{cases} f^*(x_n^*) V_n(\hat{u}(1, 1), 1) & \text{if } v \leq \hat{v}_n(b, 1) = \text{def } \frac{\hat{v}_n(1, 1)}{b^2}, \\ f^*(x_n^*) \tilde{R}_n(b^2 v) & \text{if } \hat{v}_n(b, 1) \leq v \leq \hat{v}_n(b, \phi_n), \\ f^*(x_n^*) V_n(\hat{u}(1, \phi_n), 1) & \text{if } v \geq \hat{v}_n(b, \phi_n) = \text{def } \frac{\hat{v}_n(1, \phi_n)}{b^2}. \end{cases}$$

Notice that for the middle case the optimal input and carry-forward are functions of v . We write

$$x_n(v, b) = \frac{\tilde{x}_n(b^2 v)}{b^2}, \quad u_n(v, b) = \frac{\tilde{u}_n(b^2 v)}{b^2}.$$

Let us clarify that to obtain the total value of the firm one must add to $V_n(u_n^*, b)$ the book-value of the firm, its current income as measured by $f^*(x_n^*)$, and the holding gains on the closing stock u_n^* . The holding gains (or losses) are computed, as discussed above, by reference to purchasing cost, marginal productive value, or resale price respectively (depending on the three cases displayed above).

We assume that whereas management do observe b , external investors do not observe b (see subsection 2.7). From such a point of view we refer to b as being a hidden variable; we need therefore to consider also what the uninformed external investors know about valuation of the firm. This is addressed in a corollary stated as a second theorem.

Theorem 2 (Tri-mixture characterisation of optimal value when b is hidden)

With the structural assumptions as in the preceding theorem and assuming the firm acts optimally, there exist constant earnings response coefficients $R_n^{\text{expand}}, R_n^{\text{contract}}$ and a variable response coefficient $R_n(\cdot)$ such that at each moment of time there exist values \hat{v}_n^-, \hat{v}_n^+ such that if x_n^ is the observed input, then*

$$V_n = \begin{cases} f^*(x_n^*) R_n^{\text{expand}} & \text{if } v \leq \hat{v}_n^-, \\ f^*(x_n^*) R_n(v) & \text{if } \hat{v}_n^- \leq v \leq \hat{v}_n^+, \\ f^*(x_n^*) R_n^{\text{contract}} & \text{if } v \geq \hat{v}_n^+. \end{cases}$$

We note that once the uninformed observers form estimations of \hat{v}_n^-, \hat{v}_n^+ they may back-out an estimate of the hidden parameter b .

For an insight into the proof suppose for a moment that activity terminates after the next period. Suppose that the last period investment (expansion) is to be triggered whenever that period's price b_1 is at or below a threshold price B . This means that resale of stock is triggered as soon as the resale rate $\phi_n b_1$ hits B . It follows that the expected value of stock per unit in the final period is

$$q(B, b_0) = \int_0^B b_1 dQ(b_1 | b_0) + \int_B^{B+\Delta} B dQ(b_1 | b_0) \\ + \int_{B+\Delta}^\infty \phi_n b_1 dQ(b_1 | b_0),$$

i.e., an average over replacement price, resale price and the price B of maintaining capital. The optimal choice for B is necessarily that which makes managers indifferent between buying an

Figure 1
Tri-mixture

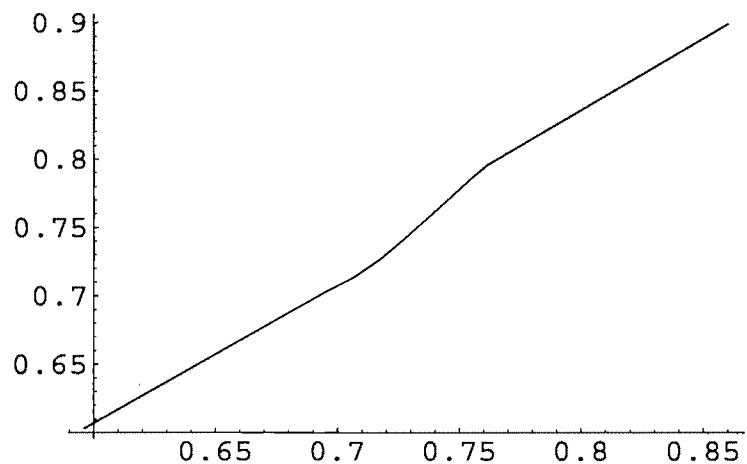
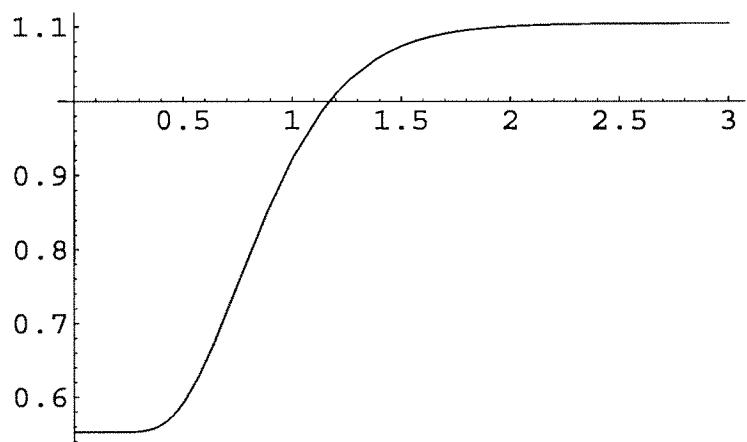


Figure 2
Graph of q



additional unit of resource for immediate use at time $t = 0$ as opposed to carrying it forward for later use at time $t = 1$, i.e. when

$$\gamma q(B, b_0) = b_0.$$

But, writing $b_1 = b_0 g$ where g has the density $dQ_1(g) = dQ(g \mid 1)$ we obtain the **fundamental multiplicative rule**:

$$q(b_0 g_1, b_0) = b_0 q_0(g_1), \quad (15)$$

where

$$\begin{aligned} q_0(g_1) &= \int_0^{s_1} g dQ_1(g) + g_1 \int_{s_1}^{s_1+M_1} dQ_1(g) \\ &\quad + \phi_1 \int_{s_1+M_1}^{\infty} g dQ_1(g). \end{aligned} \quad (16)$$

So the optimal B takes the form

$$\hat{b}_1 = b_0 \hat{g}_1 \quad (17)$$

where $g_1 = \hat{g}_1$ solves

$$\gamma q_0(g_1) = 1.$$

We call \hat{g}_1 the **first censor**. The optimal carry-forward $u = u^*$ in turn must have marginal value $f'(u^*)$ equal to $b_0 \hat{g}_1$ and so in the case where $f(x) = 2\sqrt{x}$ we obtain the multiplicative rule

$$u^* = \hat{u}(b_0) = \frac{1}{b_0^2 \hat{g}_1^2}.$$

It is noteworthy that \hat{b}_1 is a **certainty equivalent price**; indeed the manager now carries forward a quantity as though he were buying stock for use in the next period at the price \hat{b}_1 . The optimal current input is similarly $x^* = 1/b_0^2$. It now follows that the opening stock v_0 has thus been expanded to the optimal level

$$\hat{v}_0(b_0, 1) = \frac{1}{b_0^2} + \frac{1}{b_0^2 \hat{g}_1^2} = \frac{\hat{v}_0(1, 1)}{b_0^2}.$$

Evidently, for this scenario to take effect it must be that

$$v_0 < \hat{v}_0(b_0, 1).$$

This corresponds to one case displayed in the first part of Theorem 1. Now a basic **dilation scaling property** when $f(x) = 2\sqrt{x}$ is the identity that

$$V_0(u, b_0) = b_0^{-1} V_0(u b_0^2, 1).$$

Since $f''(x^*) = b_0^{-1}$ the second part of Theorem 1 now follows for this case. We note that following is an equivalent statement²¹ of the scaling property (whence its name):

$$V_0(w \lambda^{-2}, \lambda b) = \frac{1}{\lambda} V_0(w, b).$$

In closing this section we remark that

$$\begin{aligned} V'(u \mid b_0) &= \lim_{k \rightarrow 0+} \frac{V_0(u + k \mid b_0) - V_0(u \mid b_0)}{k} \quad (18) \\ &= b_0 q_0(f'(u) / b_0), \end{aligned}$$

(see (29) in Appendix A for justification) and so

$$\lim_{k \rightarrow 0+} \frac{V_0(u + k \mid b_0) - V_0(u \mid b_0)}{b_0 k} = q_0(f'(u) / b_0) \quad (19)$$

which shows that q_0 is the additional value created by expanding the capital by k over the cost of expansion $b_0 k$ so that q_0 is of course Tobin's marginal q . It is instructive to plot the graph of q_0 which is increasing and bounded as shown by Figure 2. The sigmoid shape is typical (in that it occurs at all stages of in the multi-period model).

2.5. Puts and calls: the embedded options

By analogy with ADEP we can decompose V so as to see the role of the naive present value

$$\tilde{V}'_0(u) = \gamma \int_0^{\infty} f'(u) dQ(b_1 \mid b_0)$$

(calculated as though the capital stock u is not to change). To do so we need to include a short put P (for valuing expansion) and long call C (for valuing contraction), whereupon we shall have

$$W'_0 = \tilde{V}'_0 - \gamma P' + \gamma C'.$$

We can get an analogous embedded put and call result to ADEP by comparing (10) and (28), which gives:

$$\begin{aligned} V_0(u, \phi_1, b_0) &= \\ &2\sqrt{x(b_0)} + \gamma [2\sqrt{u} \int_0^{\infty} dQ(b_1 \mid b_0) \\ &+ \int_0^{f'(u)} \left(\frac{1}{b_1} + b_1 u - 2\sqrt{u} \right) dQ(b_1 \mid b_0)] \\ &+ \int_{f'(u)+\phi_1}^{\infty} \left(\frac{1}{\phi_1 b_1} + \phi_1 b_1 u - 2\sqrt{u} \right) dQ(b_1 \mid b_0)]. \end{aligned}$$

We thus have similarly to (13)

$$V_0(u) = \tilde{V}_0(u \mid b_0) - \gamma P(u \mid b_0) + \gamma C(u \mid b_0),$$

where

²¹ Put $b_0 = \lambda b$ and $w = vb^{-2}$ and note that

$$V(w \lambda^{-2}, \lambda b) = \frac{1}{\lambda b} V(w b^2, 1) = \frac{1}{\lambda b} V(w b^2, 1) = \frac{1}{\lambda} V(w, b).$$

Alternatively, the function $H(w, b) = F(1/w^2, b)$ is homogeneous of degree -1 .

$$\begin{aligned}\hat{V}_0(u|b_0) &\equiv 2\sqrt{x(b_0)} + \gamma 2\sqrt{u} \int_0^{\infty} dQ(b_1|b_0), \\ P(u|b_0) &\equiv \int_0^{f'(u)} 2\sqrt{u} - \left(\frac{1}{b_1} + b_1 u\right) dQ(b_1|b_0), \\ C(u|b_0) &\equiv \int_{f'(u)}^{\infty} \left(\frac{1}{\phi b_1} + \phi b_1 u - 2\sqrt{u}\right) dQ(b_1|b_0),\end{aligned}$$

where, just as before, $\hat{V}_0(u)$ is the expected present value over both periods keeping the capital stock carried forward fixed at u . (Note that in view of the reciprocal relation between the a and b variables, the put and call have switched roles vis à vis ADEP.)

Computing the first-order conditions²² for the optimal value u^* of closing stock and recalling the condition $f'(u^*) = \hat{b}_1 = b_0 \hat{g}_1$ we obtain:

$$\begin{aligned}V'_0(u^*|b_0) &= \int_0^{f'(u^*)} b_1 dQ(b_1|b_0) + f'(u^*) \int_{f'(u^*)}^{\infty} dQ(b_1|b_0) + \\ &\quad + \phi \int_{f'(u^*)}^{\infty} b_1 dQ(b_1|b_0) \\ &= f'(u^*) \int_0^{\infty} dQ(b_1|b_0) - \int_0^{f'(u^*)} (f'(u^*) - b_1) dQ(b_1|b_0) \\ &\quad + \phi \int_{f'(u^*)}^{\infty} (b_1 - f'(u^*)/\phi) dQ(b_1|b_0) \\ &= \hat{b}_1 - E[\max(\hat{b}_1 - b_1, 0)] + E[\max(\phi b_1 - \hat{b}_1, 0)] \\ &= \hat{V}'_0(u^*|b_0)/\gamma - P'(u^*|b_0) + C'(u^*|b_0) \\ &= q_0.\end{aligned}\tag{20}$$

Comparison of (20) and (13) yields the key insight that the firm should evaluate the embedded investment call and put options with strike price \hat{b}_1 given by the censor. In this respect the censor \hat{g}_1 determines some kind of ‘certainty equivalent’ future unit price of inputs \hat{b}_1 , in that u is selected as though the next period price was deterministic and equal to \hat{b}_1 ; thus delivery at that price requires the planner to: (i) receive compensation / revenue

²² With due consideration for the Leibniz Rule.

²³ Alternative interpretation: The naive non-linear view is that one unit of capital next period will be worth \hat{b}_1 and leads to an inventory of $1/\hat{b}_1$ but the marginal valuation ignores the present value of the option to expand when it is cheap to do so (i.e. $b_1 < \hat{b}_1$). This will call for extra outlay (hence the negative sign of this PV) and also ignores the option to contract when $b_1 > \hat{b}_1/\phi$, so that it is worth selling for ϕb_1 which brings in extra income. It is possible to use put-call symmetry (parity) to obtain

$$\begin{aligned}F'_1(u^*, \phi, b_0) &= \int_0^{\hat{b}_1} b_1 q(b_1|b_0) db_1 + \hat{b}_1 \int_{\hat{b}_1}^{\hat{b}_1/\phi} q(b_1|b_0) db_1 + \\ &\quad + \phi \int_{\hat{b}_1/\phi}^{\infty} b_1 q(b_1|b_0) db_1 \\ &= E[b_1] - \int_{\hat{b}_1}^{\hat{b}_1/\phi} (b_1 - \hat{b}_1) q(b_1|b_0) db_1 + \\ &\quad - (1 - \phi) \int_{\hat{b}_1/\phi}^{\infty} b_1 q(b_1|b_0) db_1.\end{aligned}$$

This may be interpreted as comprising first the naive expected value of holding one unit of stock, secondly short one covered call (operable in a limited range), and finally $(1 - \phi)$ units short of an asset-or-nothing option.

against that price for surrender of expansion potential, and (ii) pay additionally to that price a compensation / cost for the right of contraction potential.²³

Remark 7: The optimal investment rule is determined by evaluating the optimal investment or divestment such that the marginal benefit of capital (Tobin’s q) is equal to the naive NPV together with the value of the marginal (short) put and (long) call options which have a strike price given by the optimally chosen censor.

2.6. Future value as q -income stream: an equivalence theorem

Since we will be comparing the ability of different income measures to forecast future firm value, we shall refer to our new indirect income measure $f^*(x)$ with a y -variable notation. This is in order to follow traditional notation for income. Specifically, we set

$$Y^q(x^*(b)) = \text{def } f^*(x^*(b)).$$

An inductive proof based on re-arrangement of terms, yields the following identity for the future value of the firm in terms of indirect profits for the undiscounted optimal future value of the project regarding the carried forward capital stock u_n as a sunk cost. Details in the two-period case are given in Appendix B. Thus instead of using the equivalence between (3) and (1) as a starting point for valuation, we prefer to establish an equivalence between (1) and the sum of: historic value (i.e. book-value) adjusted to reflect holding gains or losses, and expected future-value. These words are given exact definitions below. The precise statement is given by (24). The starting point for us is the following **value-function identity**:

$$V_n(u_n|b_n) = q_n u_n + E[\sum_{m=n+1}^N \gamma^{m-n-1} Y^q(x_m^*)].\tag{21}$$

On the right-hand side we sum the closing capital stock u_n evaluated at Tobin’s q , plus the sum of all future indirect profits, where:

- i) $Y(x) = f^*(x) = f(x) - xf'(x)$ denotes the indirect profit function associated with the production function $f(x)$;
- ii) $u_{m+1}^* = u_{m+1}^*(u_m|b_m, \dots, b_m)$ is the optimal carry-forward from period m to period $m+1$ given the price history (b_n, \dots, b_m)
- iii) $x_m^* = x_m^*(u_{m-1}, b_m)$ is the general optimal demand for input at time m (so that when the firm expands $x_m^* = G(b_m)$);
- iv) $q_m = q_m(u_m, b_m)$ is the period- m Tobin’s marginal q , defined as the average marginal benefit of utilisation of a unit of input in period m (given the current value of b_m and the closing

stock u_n of the current period). When u_n is selected optimally (given opening stock v_n) the discounted value of q_n ranges between replacement cost b_n and resale cost $\phi_n b_n$. Indeed, when u_n takes the value corresponding to optimal expansion, discounted q_n is the replacement cost, and similarly when u_n takes the value corresponding to optimal contraction, discounted q_n takes the value $\phi_n b_n$.

Rewriting the identity thus

$$\gamma[V_n(u_n | b_n) - q_n u_n] = E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)] = V_n^*(u_n | b_n), \quad (22)$$

we see that the left-hand side is the discounted future value less its marginal cost, and we denote this quantity by $\gamma V_n^*(u_n | b_n)$, consistently so, since $q_n = V_n^*$.

Our analysis of assessing future value shows the importance of Tobin's q , i.e. of marginal benefit, and we stress that this refers to replacement cost, as such, *only* in the expansion regime. It is natural, therefore, to measure current earnings as well by reference to Tobin's q , especially as both current demand and future demand have equal marginal value at an optimum (after taking due note of appropriate discounting).

Definition: The q -income at time t_n is the indirect profit, namely, the revenue less marginal cost of input, in symbols $f(x_n) - x_n f'(x_n)$, i.e. $f^*(x_n)$, where x_n and u_n have been chosen to optimise the expression

$$f(x_n) + c_n(x_n + u_n - v_n) + \mathcal{W}_n(u_n, b_n),$$

given v_n , and where $c_n = b_n$ for $x_n + u_n - v_n > 0$ and $c_n = \phi_n b_n$ for $x_n + u_n - v_n < 0$.

We note that q as introduced above is characterised along the lines of ADEP as including a certainty-equivalent price, less the put option to expand, plus the call option to contract, plus the option to carry forward unused stock; typically it is of the form

$$\begin{aligned} q_n &= \hat{b}_n - E[\max(\hat{b}_n - b_n, 0)] + E[\max(\phi_n b_n - \hat{b}_n, 0)] \quad (23) \\ &\quad + \int_{\hat{b}_n}^{b_n} (f'(x_n(u, b_n)) - \hat{b}_n) dQ(b_n | b_{n-1}) \\ &\quad + \int_{\hat{b}_n}^{b_n} (f'(x_n(u, b_n)) - \phi_n b_n) dQ(b_n | b_{n-1}), \end{aligned}$$

for some $\psi_n < \phi_n$ and so includes two further terms reflecting the value of the option to carry-forward which confers the added advantage over immediate utilisation of inputs, as shown in the first of the two additional terms, and the advantage over an immediate resale, as shown in the second of the two terms (see the Remark in Appendix A). Note that the future value of the firm, as measured in time t_{n+1} values, associated with the end of the pro-

duction period $[t_n, t_{n+1}]$ is

$$Y(x_n^*) + \gamma V_n = Y(x_n^*) + \gamma q_n u_n + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)].$$

So recalling (1) and (3), we now see that we may write down the firm equity value S_n in terms of its book-value B_n at time t_n (i.e., the cash position k_n plus historic cost $h_n v_n$ of opening stock v_n), by means of the following identity:

$$S_n = B_n + Y(x_n^*) + v_n \cdot \overline{HG}_n + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)], \quad (24)$$

where \overline{HG}_n denotes the *per unit holding gain* on opening stock, and takes the following value, given an average historic valuation of h_n per unit:

$$\begin{aligned} (U: Buying) \quad \overline{HG}_n &= b_n - h_n, \quad (RO: holding) \quad \overline{HG} \\ &= \gamma q_n - h_n, \quad (IO: selling) \quad \overline{HG} = \phi_n b_n - h_n. \end{aligned} \quad (25)$$

To see why this identity holds, consider for example the first regime, where $\gamma q_n = b_n$. We have

$$\begin{aligned} S_n &= k_n + f(x_n) - b_n(x_n + u_n - v_n) + \gamma q_n u_n + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)] \\ &= [k_n + h_n v_n] + [f(x_n) - b_n x_n] + (b_n - h_n)v_n + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)], \end{aligned}$$

and the result follows. Alternatively, the equity value may be expressed in terms of the cash position k_n at time t_n and the corresponding opening stock position v_n by the **q -income identity**

$$S_n = k_n + \gamma q_n \cdot v_n + Y(x_n^*) + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)]. \quad (26)$$

In words: the equity value comprises opening cash, q -revalued opening stock, current q -income and future q -income V^* . We recall that the q -revaluation price of stock is either b_n (i.e. replacement cost) in regime (U), or $\phi_n b_n$ (i.e. resale price) in regime (RO), or an intermediate value in regime (IO).

To summarise, our approach considers an alternative valuation identity and generalizes the earlier two-period model to multiple periods. After taking appropriate discounting, the form of the optimal value function $V(\cdot)$ comprises:

- q adjusted value of the closing capital stock
- plus the expected q -income stream.

Moreover we have established the form of $Y(x_n^*(b_n))$ given a Cobb-Douglas technology. It is satisfying that the q -income in this case is *proportional to the revenue*. For the square root function specifically: the period n indirect profit function $Y(x_n^*(b_n))$ takes a notionally simple form; it is $1/b_n$ when the project is under-invested, $1/(\phi_n b_n)$ when it is over-invested, and an intermediate value in the third regime.

Thus, for our simple square-root returns model we can identify $V_n(u_n | b_n)$ by forming expectations

over the input price process b_n . Furthermore forming this expectation simply requires looking at the appropriately censored integral of the next input price and the censoring value is the current input price b_n times a factor g_n , a generalised version of (17).

We close this section by stating an important property.

Theorem 3 (Monotonicity of V^* in Y_n^q)

Provided either the volatility is large enough, i.e. $\sigma \geq \sigma^(\phi_{n+1})$, for some positive function $\sigma^*(.)$, or, equivalently, provided the forthcoming discount factor ϕ_{n+1} is close enough to unity, i.e. $\phi_{n+1}^*(\sigma) \leq \phi_{n+1} < 1$ for some function $\phi_{n+1}^*(.)$, the function V^* regarded as a function of Y_n^q is monotonic increasing.*

We show in Appendix C that, in a two-period model, a sufficient bound is provided by the inequality $\phi_1 > \exp(-1.65\sigma)$.

2.7. Informational asymmetry

We shall henceforth assume that whereas the internal manager observes b , the investor does not. Thus at issue is whether some other accounting data may be helpful for the investor trying to form inferences on the value of $V()$. Before embarking on this route we note that it could be argued that an investor reading the annual financial accounts could be able to infer the input price of capital from the movements in capital items in the accounts. Our response here is as follows. Recall that in our introduction to the model we simplified the presentation by assuming the returns function faced by the firm was a simple square-root function and hence $f^*(x_n) = \frac{1}{b}$, that is once the q -theoretic operating profit was reported an investor knows exactly the value of b and then can readily determine the value for $V()$. Note though that our initial working assumption of the square root function was simply to ease initial presentation. The important result we derive above (24) assumes only concavity of the returns function, and in that case observing reported profit: (i) does not allow the investor to infer what b was directly, and (ii) even if the investor had some other means of finding out the true value of b , that would still not be enough to infer the functional form of $V()$. Indeed, in the case of the general Cobb-Douglas returns

function x^θ (for which $f^*(x) = (1 - \theta)f(x)$), the function $V()$ cannot be recovered from knowledge of b without knowledge of the technology returns parameter θ . That is, if the reader feels uneasy about our modelling assumption that b is unobservable to an investor, then assuming that the general returns / technology factor θ is unobservable to the investor induces the same desired result, namely, that an investor cannot from an observed profit figure disentangle what the values for b and θ are – hence directly determine the optimal value function.

Fortunately, since $f^*(x)$ is directly proportional to revenue $f(x)$, the current marginal value $f'(x)$ is proportional to the ratio of current revenue over current consumption x . So despite the relevant q -theoretic variable being the current marginal profitability $f'(x_n)/b_n$, it is appropriate for an external investor to take an interest in $f^*(x_n)$.

This identification of an asymmetry clearly raises the issue of optimal contract design within a principal-agent context.²⁴ We note that given our dynamic model setting, issues of dynamic commitment and renegotiation will immediately arise and we leave to a following study the pursuit of these extensions. Our task here is to identify the first best. In contrast to most single period agency models where this is a trivial issue, in our setting it is not, evidenced perhaps by the fact that Feltham and Ohlson have been working with a model over the last decade which clearly has not been first best (since they ignore option values).

Having identified how managers can determine the optimal future value of the firm, and on the assumption that an informational asymmetry exists between the manager and the investor, we now consider how the investor could use accounting measures to make inferences concerning the future value of the firm.

3. Using an earnings measure to infer firm value

Let us now consider how a representative investor could use an earnings measure to value a firm. Recalling the fundamental FO result:

$$\hat{y}_{t+1} = \omega \hat{y}_t + x_t + \varepsilon_{t+1}, x_{t+1} = gx_t + \eta_{t+1}$$

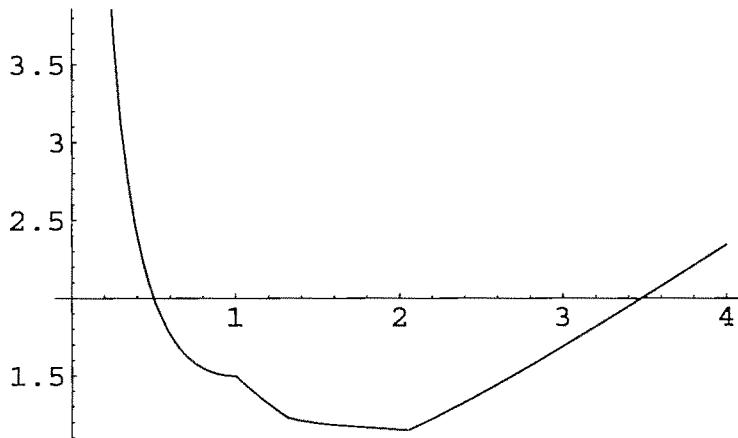
which has been used repeatedly by empiricists to test for the value relevance of accounting measures, at this stage we summarise our critique of this previous research via two remarks:

Remark 8: (Non-optimality of the FO model)
 Since the FO model does not recognise real options that arise in practice it is hard to know what (if anything) empirical tests²⁵ using the FO specification actually mean for the decision value significance of accounting measures. For instance, recalling our results on the underlying

²⁴ Our underlying model framework differs from that of Dutta and Reichelstein (1999) and Govindarajan and Ramkrishnan (2001) because they assume that the change in cash flow or earnings is linearly affected by exercise of effort on the part of the manager and do not recognise the option component of investment. As we have seen, this options component does not necessarily add to cash flow or earnings in a linear way.

²⁵ Both Feltham and Ohlson have on occasion raised concerns about the empirical applications of their model. Our critique here is with the claimed theoretical validity of empirical research claiming to apply the FO results.

Figure 3
Graph of \hat{y} vs b



naivety of the investment model in the FO approach, we comment in subsection 3.3 that only in the restrictive case of non-stochasticity in the underlying parameter is the FO residual income model consistent with our optimisation model.

Remark 9: (Non-linearity of the firm value)
By explicitly recognising the real options omnipresent with investment in real assets, we have shown that the type of linear functional relationship embodied by (4), and used so frequently by empiricists,²⁶ is inappropriate except in special cases. Instead our real-options analysis, which brings to the fore the three distinct regimes of optimal investment behaviour (contraction, maintenance and expansion), suggests that, rather than testing for accounting value relevance with a single linear regression model, an approach using finite-mixture (distribution) models with three regime changes may be appropriate. We stress that the implied linearities are between our chosen earnings measure and future value.²⁷

At least two questions naturally arise from these remarks. What is the significance for earnings based valuation of the non-optimality of FO residual income? If a simple linear regression is not representative of the underlying optimal investment environment what is an appropriate (perhaps approximate) empirical specification? We will address these questions in the following two subsections respectively.

3.1. Basing valuation on residual income

A central feature that differentiates our approach from earlier studies of the use of earnings numbers to predict future firm value is that via (21) we can actually identify exactly the variable that is being estimated. Hence we can objectively appraise the ability of a chosen earnings method such as residual income to predict future firm value. Expressed precisely, if we let \hat{y} denote residual income, then we can consider analytically, what is the relationship between the explanatory variable \hat{y} and the variable being predicted $V(\cdot)$.

We have derived analytic expressions for the residual income and they are given below. However, the qualitative features driving the form of the dependence of \hat{y} on the unobservable b_i are pictured in Figure 3, showing that the residual income \hat{y}_i at the end of the period $[t_i, t_{i+1}]$ as a function of the input price b_i , is asymptotically vertical as $b_i \rightarrow 0+$ and has a linear oblique asymptote with

²⁶ We shall discuss the extensions proposed by Burgstahler and Dichev (1997) and others in subsection 4.2.

²⁷ Alternatively we could look at the relationship between our measure of current earnings and market value S_i by recovering the relationship from (24).

positive slope as $b_i \rightarrow +\infty$. Consequently, for each level of residual income in the range (apart from the minimum) there are at least two corresponding price levels b_i , making the future value of the project ambiguous.

To see why this is, note the residual income is defined by cases as follows. If we let h_i denote the average historic unit cost of the investment asset holding of v_i at the beginning of the period $[t_i, t_{i+1}]$ it is straight-forward to compute \hat{y} by cases. First, one needs to compute critical prices at which the opening stock v_i is at the extreme end of the regime when stock is expanded and when it is contracted. The respective defining equations for these prices, denoted $b_i(v_i, 1)$ and $b_i(v_i, \phi_i)$ are evidently given by:

$$v_i = \hat{y}_i(b_i(v_i, \phi), \phi) = \frac{\hat{y}_i(1, \phi)}{b_i(v_i, \phi)^2}.$$

It is now routine to show that:

$$\hat{y}_{i+1} = \begin{cases} \frac{1}{b_i} + v_i[b_i - (1+r)b_i], & \text{for } b_i < 1/\sqrt{v_i}, \\ \frac{1}{b_i} - h_i \frac{1}{b_i} - rh_i v_i, & \text{for } 1/\sqrt{v_i} \leq b_i \leq b_i(v_i, 1), \\ 2\sqrt{x_i(v_i, b_i)} - h_i x_i(v_i, b_i) - rh_i v_i, & \text{for } b_i(v_i, 1) < b_i \leq b_i(v_i, \phi_i), \\ \frac{1}{b_i} (1 - \hat{u}_i(1, \phi)) + \phi b_i v_i + \frac{h_i(1, \phi)}{b_i^2} b_i - (1+r)v_i h_i, & \text{for } b_i > b_i(v_i, \phi_i). \end{cases}$$

where in the first case the firm is expanding and the last case selling off some investment assets.

These formulae enable us to produce the required plot of future firm value less historic cost²⁸ of investment assets carried forward ($V_n(\cdot) - h_n u_n$) against residual income $\tilde{y}(\cdot)$ as follows (Figure 4).

This plot shows clearly why it could be misleading to condition expectations of future firm value solely on accounting residual income. The plot shows that for a given level of residual income a multiplicity of future firm values may be possible. That is, there does not exist a functional relationship between residual income and future firm value and hence there is no theoretical support for the empirical practice of linearly regressing future firm value on residual income.²⁹

The intuition for this hysteresis effect arising is as follows. Compare two firms with identical residual income, one expanding investment and the other contracting. The reason the two firms with the same residual income have different future values is that the expanding firm faces a charge for the additional investment which reduces income whereas the contracting firm is selling off assets which increases income. That is the same

the residual income number may result from two distinctly different investment strategies which in turn imply different future firm value; firms contracting now are not expected to have the same future value as firms that are expanding now (holding currently observed residual income constant).

3.1.1. Convexity of future firm value in q -income

To compare our model predictions with those derived in the literature, we need to consider the equity value of the firm given its current -income A plot follows (Figure 5).

The graph has three sections corresponding to the three regimes considered earlier. We comment on the qualitative features. Define $b_n = b_n(v_n, 1), \bar{b}_n = b_n(v_n, \phi_n)$ and let

$$\underline{Y}^q = Y_n^q(b_n) = \frac{1}{b_n}, \quad \bar{Y}^q = Y_n^q(\bar{b}_n) = \frac{1}{\phi_n b_n}, \quad (27)$$

For small enough value of Y^q (i.e. less than \underline{Y}^q) the equity value of the firm takes a *convex* (in fact hyperbolic) form³⁰

$$\frac{v_n}{Y^q} - v_n h + o(Y_q)$$

in the square-root case (the first term generalising to $v_n Y^{-\theta/(1-\theta)}$, in the case of a Cobb-Douglas index α). For large values of Y^q (i.e. greater than \bar{Y}^q) the equity value is asymptotically linear and takes the form

$$(2 + V(\hat{u}(1, 1))Y^q - v_n h + v_n(Y^q)^{-\theta(1-\theta)}).$$

One may take the view that on our definition of income Y^q this quantity is unlikely to be very small and so the vertical asymptote in itself is irrelevant, but the convexity it exhibits is not out of line with the cluster-plot given in Burgstahler and Dichev (B&D)

To see how this relates to the Burgstahler and Dichev (1997) findings, recall that in essence the B&D paper empirically tests the future value of a firm by a two-period model. In the later of the two periods the earnings E_1 predict a possible future earnings stream valued at $W_1^1 = cE_1$ (where c is the earnings capitalisation factor). Management have the option to switch from this earnings stream to an alternative activity. That activity also generates a future earnings stream W_1^2 , known as adaptation value, which is a constant independent of E_1 and assumed fixed a priori at a value A . The model's empirical proxy for A is the book value B_0 . The firm currently has earnings E_0 , so the current market value of the firm S_0 comprises book value B_0 , the current earnings E_0 , and the expected value V_0 of the claim: $\max\{W_1^1, W_1^2\} = \max\{cE_1, A\}$. In a log-normal setting for the distribution of E_1 given E_0 , the value V_0 has the well-known convex shape of a call-value struck at $K = A/c$. Our model agrees

²⁸ The same qualitative features arise if we simply plot $V(\cdot)$ against $\tilde{y}(\cdot)$. We have deducted the historic cost of the investment assets carried forward so as to capture the accounting convention of matching.

²⁹ In fact what has been done in the past is even more dubious, as Lys and Lo (2000) point out, since a truncated estimate for $V(\cdot)$ is typically used.

³⁰ In fact, the exact form is

$$\phi_n b_n(v_n - \hat{u}(\phi, 1)/b^2) + \frac{1}{b_n} V(\hat{u}(\phi, 1), 1) + \frac{1}{\phi_n} - h_n v_n$$

Figure 4
Hysteresis

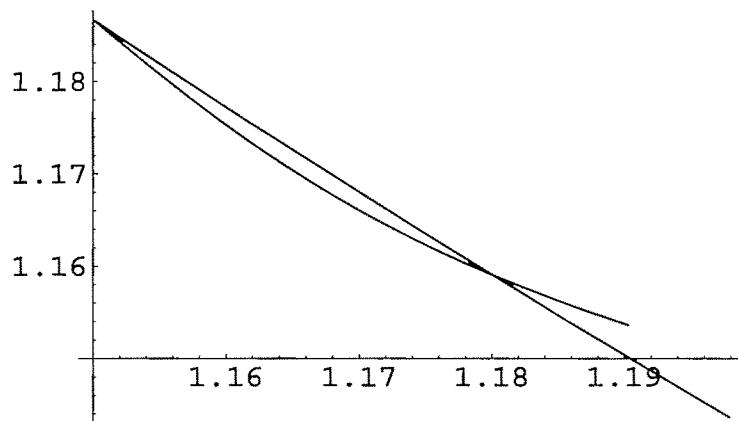
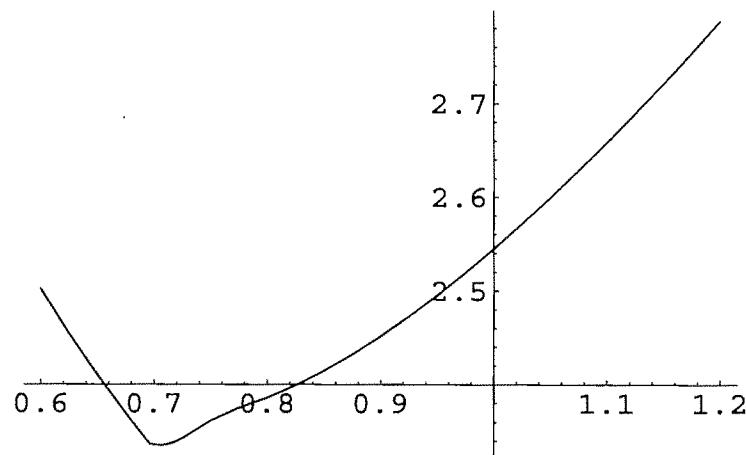


Figure 5
Graph of S vs Y^q



with the linear valuation $W_1^1 = cE_1$ but only provided E_1 is large enough. Also our model generalises the B&D assumption that management only have the option to receive a fixed income stream A for values of E_1 below some strike value K . Instead more generally in our model the adaptation value depends on the value of E_1 and is at best viewed as piecewise linear in E_1 with ranges of linearity endogenously defined by \bar{Y}^q and \hat{Y}^q . Note that B&D also subdivide the earnings range into three intervals in order to verify convexity (by testing whether the slope of the respective best linear fit to the data is increasing). Another interesting point is that presumably in order to ensure large enough subsample sizes, B&D chose to have equal numbers of observations in each interval. Given the option-valuation basis for their model, it would have been economically more intuitive had they selected their middle interval centered on the implied option strike K .

To summarise: our findings are in broad agreement with the stylised facts proposed by B&D in their option style valuation model. That is our model predicts asymptotic linearity for large values of current earnings and a convex valuation for low current earnings. However, in our model the market value can be negatively related to (low) earnings as was observed but not explained by B&D in their empirical study. Whereas they could provide no formal explanation our model shows it may be consistent with firm optimisation with non-constant abandonment value.

Before moving to the concluding section, we shall now present a subsection which shows that residual income is in fact a special case (under restrictive conditions) of q -income and hence in these special circumstances applying FO residual income is consistent with optimality of investment behaviour.

3.2. The equivalence between residual income and q -theoretic operating profit: intuition underlying the special case

We start by recalling the example of subsection 1.2. Working with current value residual income we have from (9) that

$$\hat{y}_1^{CV} = 2\sqrt{x} - b_0 x, \quad \hat{y}_2^{CV} = 2\sqrt{u} - b_1 u.$$

Noting that by suitable redefinition of notation and introducing a time script, if

$$b_0(1+r) = b_1$$

then

$$\hat{y}_1^{CV} = 2\sqrt{x_0} - bx_0 = Y(x_0^*), \quad \hat{y}_2^{CV} = 2\sqrt{x_1} - bx_1 = Y(x_1^*).$$

That is, provided $x_0 = x_0^* = (\frac{1}{b_0})^2$ and $x_1 = x_1^* = (\frac{1}{b_1})^2$, the current value residual income is identical to q -theoretic operating profit. This simple example shows how management focusing upon residual income is a special case of adopting a focus upon q -theoretic operating profit. Specifically the equivalence holds in the restricted case that the discounted input prices are constant through time. This result is just another recurrence of what we have established earlier: focusing upon residual income does not take into account the put and call, expansion and contraction options, that arise with investment decisions taken in a stochastic environment. Only in the special case where those options have no value, because the input price is constant (non-stochastic), will prediction relative to the two respective measures be equivalent. To see this recall (26)

$$S_n = k_n + \gamma q_n \cdot v_n + Y(x_n^*) + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)],$$

and that optimisation is with respect to current production x_n and future stock carried forward u_n . What is appealing about (26) is that, since q_n includes the value³¹ of embedded put and call options and of carrying forward stock, the optimisation problem is essentially separable – that is, after identification of Tobin's q_n , management can think about current period optimisation over x independently of expansion or contraction decisions for the overall level of investment stock to carry forward u_n . With reference to equation (24)

$$S_n = B_n + Y(x_n^*) + v_n \cdot \bar{HG}_n + E[\sum_{m=n+1}^N \gamma^{m-n} Y(x_m^*)],$$

note that in the case when the input price b is fixed, the $\gamma q_n u_n$ term cancels against the market price paid for the stock (zero holding gains), and

$$Y_n(x_n^*(b_n)) = \hat{y}_n^{CV}(x_n^*(b_n)).$$

However, note the converse, when $\gamma q_n u_n \neq b_n$, then $Y_n(x_n^*(b_n)) \neq \hat{y}_n^{CV}(\hat{x}_n(b_n))$.

4. Conclusion

For the FO model recall that FO superimpose (4) and (5) on (3). However, as has been argued extensively above, superimposing this simple AR(1) process on the way residual income grows, considerably restricts the type of underlying investment behaviour that could be consistent with the model. The objective of the paper has been to establish a more flexible model which facilitates an alternative representation of the expected income stream of terms $E_t(\hat{y}_{t+\tau})$ based upon optimal managerial real-options evaluation. These findings are significant because the Feltham-Olson valuation framework has been used by empiricists to test the value relevance of accounting data. Some

³¹ Recall (23).

researchers have criticised how empiricists have used the model to try to specify appropriate empirical testing procedures for the value relevance of accounting information. We address both the underlying validity of the FO model and the implications for specification of empirical testing routines. With regard to validity, we show how, independently of specifications issues, the underlying constant growth assumption which is central to the Feltham-Ohlson framework removes the possibility for management to have a role in deciding whether or not to exercise expansion and contraction possibilities, which do occur with most investment projects. Given this limitation we develop an alternative valuation framework which does not suffer from these limitations because the option to expand or contract optimally is given

centre-stage in our model of managerial decision-making. This flexible model which puts three investment regimes at centre stage also shows that a single linear regression model of the link between firm value and accounting measures is inappropriate. Instead our model shows how a regime-shifting specification (giving rise to a tri-mixture of distributions) would more effectively capture the underlying statistical relationships that apply.

Furthermore, working generally within an optimisation framework we have been able to show the comparative properties of firm valuation based upon residual or alternatively q -income. We have shown how residual income does not perform well relative to an intuitive monotonicity requirement, whereas in contrast q -income satisfies the requirement.

Appendix A: Optimisation in the two-period case

We demonstrate in this section why Tobin's marginal q naturally arises in dynamic investment decisions. Apart from its natural role in the study of optimal investment (see Romer (1996)) in the present context its usefulness is much enhanced by the way it yields a dilation scaling property from the homogeneity of the Cobb-Douglas function. This property is a trivial observation in the 'one-period-remaining' context, but the beauty of the argument is that it generalises to a multi-period setting. The section is structured as follows. First we derive optimal management behaviour in a single period model (the terminal period). From this we deduce the expected value in the penultimate period and that enables us to derive optimal behaviour in the penultimate period.

A.1. Terminal period optimisation

In the last period the maximisation of profit $f(x) - bx$ is found in the absence of opening stock by solving the first-order condition $f'(x) = b$ and taking

$$x = x^* = G(b),$$

where $G(\cdot)$ is the inverse of f' . Thus with $f(x) = 2\sqrt{x}$ we obtain $x^* = G(b) = b^{-2}$. Suppose first that the opening stock u is below x^* , the managers must purchase the balance $x^* - u$ and the profit, given that u was bought at a historic price h per unit, as we have already seen in subsection 2.4, is given by

$$f^*(x^*) + (b - h)u.$$

Next, suppose that opening stock u is above x^* . Selling off some stock now needs to be considered but at the discounted price ϕb . The analogous first-order condition argument shows that the optimal consumption shifts now to $x^* = G(\phi b)$ and any stock in excess of this value of x^* is sold; thus if $u > G(\phi b)$ the profit is

$$f(x^*) + \phi b(u - x^*) - hu = f^*(x^*) + (\phi b - h)u,$$

because this time $f(x^*) = \phi b(x^*)$. Finally suppose that $G(b) < u < G(\phi b)$. Then selling off is not optimal and u is committed to production, and then the profit is

$$f(u) - hu = f^*(u) + (f'(u) - h)u.$$

A.2. Expected value and Tobin's q

In order to describe in the next subsection optimizing behaviour under uncertainty we take a look at future profits from the perspective of one period earlier when the current price b_0 is known, the discount ϕ_1 is known, but the final price b_1 is not. Thus expected profit (setting aside discounting considerations) is given by

$$E[f^*(x^*)|b_0, \phi_1] - hu.$$

To compute this profit we partition the price range for b_1 according to whether stock needs to be expanded/contracted or maintained and take expectations using the formulas for profit obtained in the preceding subsection. Clearly the end-points of the maintain region are determined by the two conditions $f'(u) = b_1$ and $f'(u) = \phi_1 b_1$. The expected profit, ignoring sunk costs, is $V_0(u|\phi_1, b_0)$ and is thus given by:

$$V_0(u|\phi_1, b_0) = \int_0^{f'(u)} \left(\frac{1}{b_1} + b_1 u \right) dQ_1 + \int_{f'(u)}^{\phi_1 f'(u)} f'(u) dQ_1 + \int_{\phi_1 f'(u)}^{\infty} \left(\frac{1}{\phi_1 b_1} + \phi_1 b_1 u \right) dQ_1 \quad (28)$$

where dQ_1 stands for $dQ_1(b_1|b_0)$, and the expected profit is then $V_0 - hu$. The expected marginal value of capital, which we will show below is Tobin's marginal q , is thus

$$V'_0 = \frac{\partial V_0}{\partial u} = \int_0^{f'(u)} b_1 dQ_1 + \int_{f'(u)}^{\phi_1 f'(u)} f'(u) dQ_1 + \int_{\phi_1 f'(u)}^{\infty} \phi_1 b_1 dQ_1.$$

By (16) and (15) we see that

$$V'_0(u|\phi_1, b_0) = q(f'(u), b_0) = b_0 q_0(f'(u)/b_0). \quad (29)$$

From this it follows that (19) holds.

A.3. Penultimate-period optimisation: the censor multiplicative rules

For clarity put $f(x) = 2\sqrt{x}$ and suppose the manager has opening stock v_0 . Suppose first that he seeks to maximise over consumption and carry-forward variables x, u the objective function

$$2\sqrt{x} - b_0(x + u - v_0) + \mathcal{W}_0(u, b_0)$$

where $z = x + u - v_0 \geq 0$ is the additional purchase. This has solution $x = x^*(b_0) = G(b_0)$, and $u = u^*(b_0)$ given by the equation

$$\mathcal{W}'_0(u, b_0) = b_0.$$

On making use of (29) we have $\gamma q_0(f'(u)/b_0) = 1$ and this amounts to solving for g_1

$$\mathcal{W}_0(g_1) = 1,$$

and setting $b_0 g_1 = 1/\sqrt{u}$. Subject to the conditions of subsection 2.3 this has a unique solution, since reference to $q_0'(g)$ shows q_0 to be increasing with lower bound equal to $\phi_1 E[b_1|b_0]$ and upper bound equal to $E[b_1|b_0]$. We thus obtain the **first censor multiplicative rule** for the determination of the closing stock

$$\hat{u}(b_0, 1) = \frac{1}{(\hat{g}_1 b_0)^2} = \frac{\hat{u}(1, 1)}{b_0^2}. \quad (30)$$

We call g_1 the **first censor** (of time $t = 0$). We see that the optimal carry-forward is determined multiplicatively by the current price and a constant of the model, namely $\hat{u}(1, 1)$. In this latter form the rule extends to a multi-period setting. The opening stock v_0 has thus been expanded to the optimal level

$$\hat{v}_0(b_0, 1) = \frac{1}{b_0^2} + \frac{1}{(\hat{g}_1 b_0)^2} = \frac{\hat{v}_0(1, 1)}{b_0^2},$$

given by a multiplicative rule. Evidently, for this scenario to take effect it must be that $v_0 < \hat{v}_0(b_0, 1)$.

We have as an immediate consequence of the first censor multiplicative rule and of the observation that, by inspection (from 28), when $f(x) = 2\sqrt{x}$,

$$V_0(u, b_0) = b_0^{-1} V_0(ub_0^2, 1).$$

This is the fundamental dilation scaling property of future value. Since $f(x) = 2\sqrt{x}$, implies $f^*(x_0^*) = b_0^{-1}$ we have

$$V_0(\hat{u}(b_0, 1), b_0) = f^*(x_0^*) V_0(\hat{u}(1, 1), 1),$$

i.e. the future value is directly proportional to the q -income, a result which not only generalises to all Cobb-Douglas functions, but also to the multi-period setting. We have therefore identified the corresponding **expansive earnings response coefficient** to be

$$V_0(\hat{u}(1, 1), 1).$$

Suppose next that the manager seeks to contract stock by selling off. The analysis just given is only slightly modified. This time the consumption is $G(\phi_0 b_0) = (\phi_0 b_0)^{-2}$ and as for the optimal carry forward we need to solve

$$\gamma_{\eta_0}(g_1) = \phi_0.$$

Provided $\phi_0 > \phi_1 E(b_1/b_0)$ this has a unique solution (but otherwise selling stock off is suboptimal). It is convenient to define $\hat{g}_1(\phi)$ by the equation

$$\gamma_{\eta_0}(\hat{g}_1(\phi)\phi) = \phi,$$

so that $\hat{g}_1(1)$ is the first censor and $\hat{g}_1(\phi_1)$ is the **second censor** (of time $t = 0$). With this notation the optimal carry-forward is now for the two cases $\phi \in \{1, \phi_0\}$ given by the multiplicative rule

$$\hat{u}(b_0, \phi) = \frac{1}{\hat{g}_1(\phi)^2 (\phi b_0)^2} = \frac{\hat{u}(1, \phi)}{(\phi b_0)^2}. \quad (31)$$

The opening stock has thus been contracted to the optimal level

$$\hat{v}_0(b_0, \phi_0) = \frac{1}{(\phi_0 b_0)^2} + \frac{1}{(\hat{g}_1(\phi_0) \phi_0 b_0)^2} = \frac{\hat{v}_0(1, \phi_0)}{(\phi_0 b_0)^2},$$

which also employs a multiplicative rule. For this scenario to take effect it must be that $v_0 > \hat{v}_0(b_0, \phi_0)$.

Again by the dilation scaling property we have

$$V_0(\hat{u}(b_0, \phi_0), b_0) = b_0^{-1} V_0(\hat{u}(1, \phi_0), 1) = f^*(x_0^*) \{ \phi_0 V_0(\hat{u}(1, \phi_0), 1) \},$$

since in this case $f^*(x_0^*) = (\phi_0 b_0)^{-1}$ and hence the future value is linear in $f^*(x_0^*)$. We have thus identified the corresponding **contractive earnings response coefficient** to be

$$\phi_0 V_0(\hat{u}(1, \phi_0), 1).$$

Remark. Suppose that the opening stock v_0 is the result of previous activity when the input price was unity and the carry-forward was computed to be \hat{b}_0^{-2} . Suppose that $b_0 = \hat{b}_0/\psi_0$ is such that resale is just optimal then

$$v_0 = \frac{1}{\hat{b}_0^2} = \frac{1}{(\phi_0 b_0)^2} + \frac{1}{(\hat{g}_1(\phi_0) \phi_0 b_0)^2} > \frac{1}{(\phi_0 b_0)^2}$$

so that $\phi_0(b_0/\psi_0) > \hat{b}_0$ and hence

$$\psi_0 < \phi_0.$$

Thus, in all but the last period, resale is triggered in expectation at a price \hat{b}_n/ψ_n to the right of \hat{b}_n/ϕ_n . Evidently, this shift to a higher price is the effect of having the option to carry-forward stock (absent in the final period) which in the price range $[\hat{b}_n, \hat{b}_n/\phi_n]$ confers advantages over immediate utilisation of inputs (having marginal value is \hat{b}_n/ϕ_n) and in the price range $[\hat{b}_n/\phi_n, \hat{b}_0/\psi_n]$ confers advantages over immediate resale of inputs (having marginal value is $\phi_0 b_n$).

Suppose finally that the manager is faced with the scenario that

$$\hat{v}_0(b_0, l) < v_0 < \hat{v}_0(b_0, \phi_0),$$

in which case he maximises

$$2\sqrt{x} + \gamma V_0(v_0 - x, b_0, \phi_0).$$

The corresponding first-order condition determining the optimal $x = x_0(v_0)$ is given by

$$\frac{1}{\sqrt{x_0}} = V'_0(v_0 - x, b_0) = V'_0(u_0(v_0), b_0).$$

(The dash refers to differentiation with respect to u). Write $u_0(v_0) = v_0 - x_0(v_0)$ and put

$$\tilde{v}_0 = b_0^2 v_0, \quad \tilde{x}_0 = b_0^2 x_0, \quad \tilde{u}_0 = b_0^2 u_0.$$

The fundamental multiplicative rule readily implies the equation

$$\frac{1}{\sqrt{\tilde{v}_0 - \tilde{u}_0(\tilde{v}_0)}} = V'_0(\tilde{u}_0(\tilde{v}_0), l), \quad (32)$$

for a special function $\tilde{u}_0(\cdot)$ of the model which is independent of b_0 . Now let us point out that the implicit formula just derived may be turned into an explicit format after inverting the roles of dependent and independent variables:

$$\tilde{v}_0(\tilde{u}_0) = \tilde{u}_0 + (V'_0(\tilde{u}_0, l))^{-2},$$

so that $\tilde{v}_0(\tilde{u}_0)$ is easily computable and thence $\tilde{u}_0(\tilde{v}_0)$ is obtained by inverting the function $\tilde{v}_0(\tilde{u}_0)$. See Figure 6.

In summary, our argument yields a third multiplication rule – namely that the optimal consumption is given by

$$x_0 = x_0^*(b_0) = \frac{\tilde{x}_1(b_0^2 v_0)}{b_0^2}$$

where $\tilde{x}_1(v) = v - \tilde{u}_0(v)$ is a special function obtained from (32), and the optimal carry-forward is given likewise by

$$u_0 = u_0^*(b_0) = \frac{\tilde{u}_1(b_0^2 v_0)}{b_0^2}.$$

These equations are reminiscent of (30) and (31) but here the numerators are not constants.

We again have

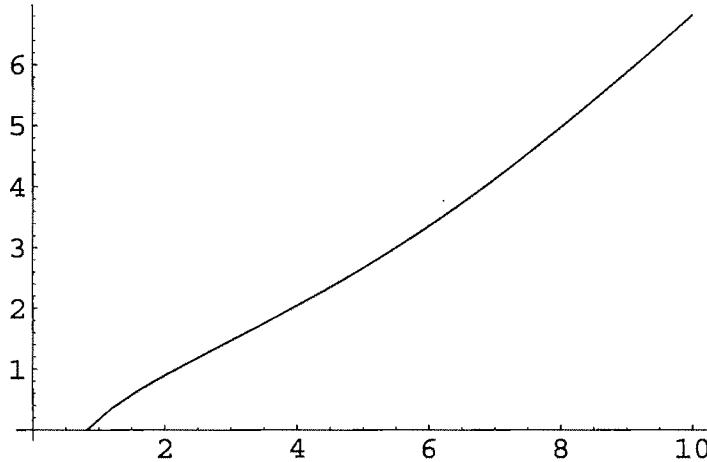
$$V_0(u_0^*(b_0), b_0) = b_0^{-1} V_0(b_0^2 u_0^*(b_0), l) = b_0^{-1} V_0(\tilde{u}_0(b_0^2 v_0), l),$$

But now $f^*(x_0^*) = \sqrt{x_0^*(b_0)} = b_0^{-1} \sqrt{\tilde{x}_0(b_0^2 v_0)}$, so we have that

$$V_0(u_0^*(b_0), b_0) = f^*(x_0^*) \frac{V_0(\tilde{u}_0(b_0^2 v_0), l)}{\sqrt{\tilde{x}_0(b_0^2 v_0)}}.$$

Note the second factor is not a constant; it is the **variable earnings response coefficient** interpolating continuously between the contractive and expansive constant coefficients.

Figure 6
Graph of $\tilde{v}(\tilde{u})$ against \tilde{u}



Appendix B: q -income based equivalence theorem

As indicated above, we give only a proof in the two-period model. Assuming a capital stock of u at the end of the first period and writing Q for $Q(b_1 | b_0)$, and $b_1(u)$ for $1/\sqrt{u}$, we have:

$$\begin{aligned}
 & V_0(u, b_0, \phi_1) \\
 &= \int_0^{b_1(u)} \left(\frac{1}{b_1} + b_1 u \right) dQ + 2\sqrt{u} \int_{b_1(u)}^{b_1(u)\phi_1} dQ + \int_{b_1(u)\phi_1}^{\infty} \left(\frac{1}{\phi_1 b_1} + u \phi_1 b_1 \right) dQ \\
 &= \int_0^{b_1(u)} \frac{1}{b_1} dQ + \int_{b_1(u)}^{b_1(u)\phi_1} \sqrt{u} dQ + \int_{b_1(u)\phi_1}^{\infty} \frac{1}{\phi_1 b_1} dQ \\
 &\quad + u \left[\int_0^{b_1(u)} b_1 dQ + \frac{1}{\sqrt{u}} \int_{b_1(u)}^{b_1(u)\phi_1} dQ + \int_{b_1(u)\phi_1}^{\infty} \phi_1 b_1 dQ \right] \\
 &= \int_0^{b_1(u)} f^*(G(b_1)) dQ + \int_{b_1(u)}^{b_1(u)\phi_1} f^*(u) dQ + \int_{b_1(u)\phi_1}^{\infty} f^*(G(\phi_1 b_1)) dQ \\
 &\quad + u \left[\int_0^{b_1(u)} b_1 dQ + b_1(u) \int_{b_1(u)}^{b_1(u)\phi_1} dQ + \int_{b_1(u)\phi_1}^{\infty} \phi_1 b_1 dQ \right] \\
 &= E[f^*(x_1^*(b_1))] + u q_0(b_1(u)).
 \end{aligned}$$

Appendix C: Monotonicity³² of V^*

Recall that $u(v, b)$ is the optimal carry-forward when the current resource price is b and the stock v held is such that no units of resource are acquired nor resold. We need to consider the marginal valuation

$$\begin{aligned} P(b) &= F(u(v, b), b) - u(v, b)F'(u(v, b), b) \\ &= \frac{1}{b}[F(\tilde{u}, 1) - \tilde{u}F'(\tilde{u}, 1)] \end{aligned}$$

(note that $\tilde{u}(vb^2) = u(v, b)/b^2$), or dropping the second variable

$$P(b) = \frac{1}{b}[F(U(b^2v)) - U(b^2v)F'(U(b^2v))],$$

which is of central importance to us. It represents the benefit of the future value of $w = b^2v$ relative to the current price level b . Here $U(w)$ denotes the solution to the equation

$$f'(w - U(w)) = F'(U(w)).$$

We will verify that $P(b)$ is decreasing with b .

C.1. An equivalent formulation

Put $b = \sqrt{w/v}$ (i.e. $w = b^2v$), and since w increases with b , write

$$P(\sqrt{w/v}) = \frac{\sqrt{v}}{\sqrt{w}}[F(U(w)) - U(w)F'(U(w))].$$

Since v is constant we shall show that the following is decreasing with w :

$$\frac{1}{\sqrt{w}}[F(U(w)) - U(w)F'(U(w))].$$

This is the ratio of future profit to current 'profit' $2\sqrt{w} - w\frac{1}{\sqrt{w}} = \sqrt{w}$ in which the current cost is measured at the marginal value of $1/\sqrt{w}$. This leads to a further simplification. Put $u = U(w)$, so that $w = V(u)$, where $w = V(u)$ is the inverse function to $u = U(w)$. Thus $V(u)$ solves the equation

$$f'(V(u) - u) = F'(u).$$

(Compare Appendix A.) We therefore consider the ratio

$$\frac{F(u) - uF'(u)}{\sqrt{V(u)}}.$$

C.2. An integral inequality

Let

$$\begin{aligned} \Pi(u) &= F(u) - uF'(u) \\ &= \int_0^{1/\sqrt{u}} \left(\frac{1}{b_i} dQ_i + \int_{b_i \sqrt{u}}^{b_i \sqrt{u}} \sqrt{u} dQ_i + \int_{b_i \sqrt{u}}^u \frac{1}{\phi_i b_i} dQ_i \right) \end{aligned}$$

We consider

$$\frac{\Pi(u)}{\sqrt{V(u)}} = \frac{\Pi(u)}{\sqrt{u}} \cdot \sqrt{\frac{u}{V(u)}}.$$

The left-hand side is an intertemporal comparison of the future use of the apportioned resource u , against the immediate use of the entire resource $V(u)$. On the right-hand side $\Pi(u)/\sqrt{u}$ compares the future profit from use of u to the immediate profit from the use of u on its own (which would have led to a benefit $f''(u) = \sqrt{u}$).

³² We gratefully acknowledge the contribution of Graham Brightwell to this Appendix.

We now let

$$\begin{aligned} K(u) &= \text{def } \Pi(u) / \sqrt{u} \\ &= \frac{1}{\sqrt{u}} \int_0^{1/\sqrt{u}} \frac{1}{b_1} dQ_1 + \int_{1/\sqrt{u}}^{\infty} dQ_1 + \frac{1}{\sqrt{u}} \int_{1/\phi_1 \sqrt{u}}^{\infty} \frac{1}{\phi_1 b_1} dQ_1 \\ &= \frac{1}{\sqrt{u}} X + Y \end{aligned}$$

where $X = X_1 + X_2$ and

$$X_1 = \int_0^{1/\sqrt{u}} \frac{1}{b_1} dQ_1, \quad X_2 = \int_{1/\phi_1 \sqrt{u}}^{\infty} \frac{1}{\phi_1 b_1} dQ_1, \quad Y = \int_{1/\sqrt{u}}^{\infty} dQ_1. \quad (33)$$

Similarly, we may consider the ratio of future marginal benefit $F'(u)$ to the immediate marginal benefit of using u namely $1/\sqrt{u}$. We thus put

$$\begin{aligned} L(u) &= \text{def } \sqrt{u} F'(u) \\ &= \sqrt{u} \int_0^{1/\sqrt{u}} b_1 dQ_1 + \int_{1/\sqrt{u}}^{\infty} dQ_1 + \phi \sqrt{u} \int_{1/\phi_1 \sqrt{u}}^{\infty} b_1 dQ_1 \\ &= \sqrt{u} Z + Y, \end{aligned}$$

where $Z = (Z_1 + Z_2)$ and

$$Z_1 = \int_0^{1/\sqrt{u}} b_1 dQ_1, \quad Z_2 = \phi_1 \int_{1/\phi_1 \sqrt{u}}^{\infty} b_1 dQ_1 \quad (34)$$

Note that the 'apportionment ratio' is

$$\frac{V(u)}{u} = \frac{1}{u} (u + F'(u)^{-2}) = 1 + L(u)^{-2}.$$

The ratio of interest is thus

$$A(u) = \text{def } \frac{K(u)}{\sqrt{1 + L(u)^{-2}}} = \frac{\Pi(u)}{\sqrt{u}} \cdot \sqrt{\frac{u}{V(u)}},$$

and we will show $A'(u) < 0$.

As a preliminary we compute that

$$K'(u) = -\frac{1}{2} u^{-3/2} \int_0^{1/\sqrt{u}} \frac{1}{b_1} dQ_1 - \frac{1}{2} u^{-3/2} \int_{1/\phi_1 \sqrt{u}}^{\infty} \frac{1}{\phi_1 b_1} dQ_1 < 0,$$

so that we have

$$K(u) = \frac{X}{\sqrt{u}} + Y, \quad -K'(u) = \frac{X}{2u^{3/2}}.$$

Likewise

$$L'(u) = \frac{1}{2} u^{-1/2} \int_0^{1/\sqrt{u}} b_1 dQ_1 + \frac{1}{2} u^{-1/2} \phi \int_{1/\phi_1 \sqrt{u}}^{\infty} b_1 \sqrt{u} dQ_1,$$

and again

$$L(u) = \sqrt{u} Z + Y, \quad L'(u) = \frac{Z}{2\sqrt{u}}.$$

Now

$$\begin{aligned} A'(u) &= \frac{K'(u)}{\sqrt{1 + L(u)^{-2}}} + \frac{K(u)}{(1 + L(u)^{-2})^{3/2}} \frac{L'(u)}{L(u)^3} \\ &= \frac{1}{L(u)^3 (1 + L(u)^{-2})^{3/2}} [K'(u)(L(u)^3 + L(u)) + K(u)L'(u)] \end{aligned}$$

We will show that³³

$$-K'(u)(L(u)^3 + L(u)) > K(u)L'(u),$$

or

$$\frac{1}{2}u^{-3/2}X[\sqrt{u}Z + Y + L^3] > \frac{Z}{2\sqrt{u}}\left[\frac{X}{\sqrt{u}} + Y\right],$$

i.e.

$$\frac{X}{u}[\sqrt{u}Z + Y + L^3] > Z\left[\frac{X}{\sqrt{u}} + Y\right].$$

or, on subtracting XZ/\sqrt{u} from each side

$$\frac{X}{u}[Y + L^3] > YZ.$$

Thus with $X^* = X/\sqrt{u}$ and $Z^* = \sqrt{u}Z$ we will deduce monotonicity from the condition that

$$X^*[Y + L^3] > YZ^*. \quad (35)$$

C.3. Verification

In this section we verify (35) provided ϕ_1 is not too small, namely provided

$$\phi_1 > \exp(-1.65396\sigma), \quad (36)$$

(so that for a typical annual standard deviation σ of 30% we require $\phi_1 > 60\%$). Alternatively for a given ϕ_1 this requires that

$$\sigma > \frac{\ln 1/\phi_1}{1.65396}.$$

Recalling the definitions of X and Y given in (33) and Z in (34) we have that

$$L = \sqrt{u}F'(u) = \sqrt{u}Z + Y = Z^* + Y.$$

The argument now divides according as $L \leq 1$, or $L > 1$, i.e., $Z^* \leq 1 - Y$, or $Z^* > 1 - Y$.³⁴

Case $Z^* \leq 1 - Y$, i.e. $L \leq 1$

We claim that when $L \leq 1$ we have the stronger strict inequality, which evidently implies (35), namely that

$$X^* > Z^*.$$

Indeed by Jensen's Inequality $KL > 1$, so if $L \leq 1$ then $K > 1 \geq L$ and in particular

$$X^* + Y > Z^* + Y.$$

³³ Alternatively, we require that

$$-K'(u)L(u)^3 > K(u)L'(u) + K'(u)L(u)$$

and the left-hand side is positive. Thus the condition is satisfied in any u interval where KL is decreasing in u .

³⁴ Since the optimal hedge $u = \hat{u}$ is such that

$$\int_0^{u/\sqrt{u}} b_1 dQ_1 + \int_{(K_1, \sqrt{u})}^\infty \phi_1 b_1 dQ_1 + \frac{1}{\sqrt{u}} \int_{(1/\sqrt{u}, \sqrt{u})}^{(K_1, \sqrt{u})} dQ_1 = 1,$$

i.e. $L = \sqrt{u}$, the two cases we consider when $u = \hat{u}$ are accordingly $\hat{u} \leq 1$ or $\hat{u} > 1$ respectively.

Remark. We have just verified that in this case $0 > K(u)L'(u) + K'(u)L(u)$, that is KL is decreasing in u .

Case $Z^* \geq 1 - Y$. i.e. $L \geq 1$, or $\hat{u} > 1$

Here we show that provided (36), the condition (35) holds and in fact we prove a tighter condition. By Jensen's Inequality

$$\begin{aligned} XZ \\ = & \left(\int_0^{1/\sqrt{u}} \frac{1}{b_i} dQ_i + \int_{1/\phi_1 \sqrt{u}}^\infty \frac{1}{\phi_1 b_i} dQ_i \right) \left(\int_0^{1/\sqrt{u}} b_i dQ_i + \int_{1/\phi_1 \sqrt{u}}^\infty \phi_1 b_i dQ_i \right) \\ & > (1-Y)(1-Y) \end{aligned}$$

i.e.

$$X^*Z^* = XZ > (1-Y)^2.$$

To satisfy (35), it is equivalent to have

$$X^*Z^*(Y+L^3) \geq Y(Z^*)^2$$

and thus enough to have

$$(1-Y)^2(Y+L^3) > Y(Z^*)^2.$$

We now employ a monotonicity argument; we consider the function of Z^* defined by:

$$\Delta(Z^*) = (1-Y)^2(Y + [Y + Z^*]^3) - Y(Z^*)^2,$$

thus we are treating Z^* as a free variable and Y fixed at its true value (when u is given). Observe that the function Δ is strictly positive (and the strict inequality is true) when $Z^* = 1 - Y$. Indeed

$$\Delta(1-Y) = (1-Y)^2(Y+1) - Y(1-Y)^2 = (1-Y)^2.$$

In the case under consideration we have $Z^* > 1 - Y$. So we check that $\Delta(Z^*)$ is increasing in Z^* . We differentiate with respect to Z^* to obtain

$$\Delta' = (1-Y)^2(3[Y + Z^*]^2) - 2YZ^*.$$

If $(1-Y)^2 > 1/6$ (i.e. $Y < 1 - 1/\sqrt{6}$ which we term 'the $\sqrt{6}$ condition') we obtain

$$\Delta' > \frac{1}{2}[Y + Z^*]^2 - 2YZ^* \geq 0,$$

since $[Y + Z^*]^2 \geq 4YZ^*$. We are now done, i.e. the inequality holds in the case that $Z^* > 1 - Y$ subject to the $\sqrt{6}$ condition on Y holding and in fact we have

$$\Delta > (1-Y)^2 > \frac{1}{6}. \quad (37)$$

We now study the $\sqrt{6}$ -condition and show that this is implied by (36).

C.4. The $\sqrt{6}$ condition

By this we mean the probability

$$Y = P[\phi_1 t \leq b_1 \leq t] < 1 - \frac{1}{\sqrt{6}},$$

with $\phi_1 < 1$ where $t = 1/\phi_1 \sqrt{u}$. Now let $P_1(t) = P[b_1 \leq t]$ then

$$P[\phi_1 t \leq b_1 \leq t] = P_1(t) - P_1(\phi_1 t)$$

is easy to study. We have for $m = \mu_b - \frac{1}{2}\sigma_b^2$

$$P_1(t) = \Phi((\log t - m)/\sigma).$$

For $t > 0$ the function $P_1(t) - P_1(\phi_1 t)$ has a maximum when $t = e^m/\sqrt{\phi_1}$ equal to

$$1 - 2\Phi\left(\frac{1}{2\sigma} \log \phi_1\right).$$

So for $t > 0$ the $\sqrt{6}$ -condition holds uniformly in t provided ϕ_1 is large enough, namely

$$1 - 2\Phi\left(\frac{1}{2\sigma} \log \phi_1\right) < 1 - \frac{1}{\sqrt{6}},$$

or

$$\log \phi_1 > 2\Phi^{-1}\left(\frac{1}{2\sqrt{6}}\right)\sigma = -1.65396\sigma,$$

i.e., the condition (36).

C.5. N-fold version

In this section of the Appendix we indicate why in the multiple-period setting it is still true that provided ϕ_1 is large enough Π is decreasing in price b_1 and so V^* is increasing in q -income. One identifies a condition for monotonicity analogous to that of the two period model and verifies that it holds provided that the forthcoming discount factor ϕ_1 approaches unity. This kind of argument does not give an explicit bound for ϕ_1 although the condition (36) still needs to hold. The idea of the proof is to demonstrate that the new condition analogous to (35) reduces back to the old condition (35) when we ignore certain terms. As the old condition (35) is a strict inequality and in fact (37) holds, we deduce our result by showing that the additional terms tend to zero as ϕ_1 tends to unity. The additional terms contain as factors the two integrals

$$\int_{b(v)}^{b(v, b_1)} \frac{x(v, b_1) / v - x'(v, b_1)}{\sqrt{x(v, b_1)}} dQ_1, \quad \int_{b(v)}^{b(v, b_1)} \frac{[x(v, b_1) / v - x'(v, b_1)]}{x(v, b_1)^{3/2}} dQ_1.$$

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Discussion of 'Predicting firm value: The superiority of *q*-theory over residual income' by Miles Gietzmann and Adam Ostaszewski

John O'Hanlon*

1. Background and introduction

The traditional dividend capitalisation model expresses the value of the firm's equity capital as being equal to the present value of expected future dividends. As is now well known, provided that forecasts of dividends and forecasts of accounting incomes and book values articulate with each other in accordance with the clean surplus relationship (CSR), the intrinsic value of the firm's equity can be expressed equivalently as the book value of equity plus the present value of expected future residual incomes. The resultant valuation model is sometimes termed the residual income valuation model (RIVM). A development in the application of the RIVM is the use of linear information models (LIMs) to give valuation multiples that can be applied to current realisations to give the present value of expected future residual incomes, as in Ohlson (1995) and Feltham and Ohlson (1995) (FO). In Ohlson (1995), the present value of expected future residual incomes is represented as a multiple of current residual income plus a multiple of 'other information'. The valuation multiple applied to residual income reflects the cost of equity and a constant residual income persistence parameter. FO use a similar but more complicated LIM-based version of the RIVM that includes an additional book value term.

Managers of businesses are likely to work in settings where it is optimal to increase operating capital (invest) when conditions are above an upper threshold, decrease operating capital (disinvest) when conditions are below a lower threshold, and neither invest nor disinvest when conditions are between the upper and lower thresholds. In such settings, the current level of operating capital will

depend not only on current conditions but also on the history of past conditions. It is easy to appreciate that the interpretation for valuation purposes of accounting numbers generated in such settings might vary depending upon the firm's recent history of contraction or expansion, and upon the contraction and expansion opportunities that it currently faces. This way of thinking is second nature to valuation practitioners, as can be seen from inspection of analysts' reports, and to those who use cases to teach financial statement-based valuation at a practical level.

The paper by Gietzmann and Ostaszewski (GO) provides an interesting and challenging exposition of how the real options literature, and particularly the study by Abel et al. (1996), might contribute in incorporating this way of thinking into the accounting-based valuation literature. GO argue that insights from the real options literature can help relax the unduly restrictive constant-parameter assumption conventionally found in the LIM-based application of RIVM, such as to deal with settings in which firms adopt flexible investment strategies. They propose an accounting-based valuation procedure based on '*q*-income', which involves the recognition of holding gains.

My comments focus on two points. First, I observe that the complexity of the GO analysis is indicative of the barriers that exist to the formal incorporation of insights from the real options literature into the practice of accounting-based valuation, or the practice of empirical market-based accounting research. Second, I observe that accounting numbers and forecasts thereof are conventionally presented in historical cost terms, and that the adjustment of such numbers to another valuation basis for use in valuation models can generate considerable complexity, even in a simple setting. I elaborate on these comments in the following sections.

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2. Relaxing the restrictive features of the LIM-based approach from Ohlson (1995) and Feltham and Ohlson (1995) (FO)

GO argue that the constant-parameter LIM-based approach to residual income valuation found in Ohlson (1995) and FO is too inflexible to cope with settings in which the relationship between current and expected future accounting numbers, and the valuation multiple to be applied to current accounting numbers, can vary depending upon the context.

Clearly, the LIM-based approach can be criticised on these grounds. However, it is important to ask why the 'unrealistically simple' LIM-based approach to valuation was advanced by such eminent scholars as Feltham and Ohlson, and why it has exerted such an influence on the accounting-based valuation literature. I feel that the answer lies in the fact that, within the limits imposed by its simplifying assumptions, it illustrates in a rigorous and parsimonious manner how the inputs to an accounting-based valuation model fit together. Consider what should ideally feature within a theoretically-founded valuation model based on current realisations of accounting numbers. Put simply, it is desirable that the current realisations of accounting numbers be combined with (i) information not yet reflected in accounting numbers, (ii) measures of persistence in accounting numbers, (iii) a model of the link between expected future cash flows to owners and expected future accounting numbers, and (iv) an estimate of the cost of capital. Even simply put, the model-building task looks complicated, but Ohlson (1995) and FO did a good job of combining the key features in a way that is accessible to a wide range of readers of the accounting literature. As might be seen from Barth et al. (2002) and O'Hanlon (1996), the introduction of 'real-world' complexities, such as interactions between several information variables or univariate time series generating processes more complex than AR(1), can give rise to valuation models of a complexity that can interfere with practical applicability. Practitioners and empirical researchers have to find a compromise between models that suffer from excessive parsimony at one end of the spectrum and those that suffer from unmanageable complexity at the other. I have no evidence that the LIM-based approach from Ohlson (1995) and FO has been adopted to a significant degree by practitioners but, for empirical researchers seeking a theoretical basis for tests of the relationship between share prices and accounting numbers, it seems to provide a reasonable compromise, as evidenced by its frequent use as a theoretical basis for such tests (Easton, 1999).

Nevertheless, empirical evidence such as that presented by Burgstahler and Dichev (1997) suggests that option-related non-linearities may arise

in the relationship between economic values and accounting numbers, and should be addressed in theoretical models of the links between these items. GO's analysis provides valuable insights into how factors giving rise to context-specific real options-related valuation multiples might be incorporated into accounting-based valuation models. The complexity of their analysis suggests that the literature faces a challenge in packaging the relevant insights in a way that enables them to be incorporated into the practice of valuation and/or the practice of empirical market-based accounting research. GO have made some progress in this regard in distilling their insights into their equations (24) and (26). I look forward to further developments which might facilitate the application of these insights to observable accounting numbers and forecasts thereof.

3. Valuation models that make use of current value accounting numbers

GO suggest a valuation model that incorporates elements of current value accounting in that it involves the recognition of holding gains. This outcome might be expected in a study aimed at deriving a context-specific accounting-based valuation model. However, in settings where accounting numbers and forecasts thereof are conventionally presented on an historical cost basis, there are problems in working with valuation models that require the adjustment of these historical cost based numbers to another valuation basis. In this section, I should like to focus on this issue.

First, I refer to the argument in the early part of GO's paper that current value-based residual income is simpler to work with in valuation models than historical cost-based residual income, because it avoids the need to keep track of unused stocks of assets. Although this argument is not central to the subsequently derived results in GO's paper, analysis of it is instructive to emphasise that the use of current value numbers in valuation is likely to increase rather than reduce complexity. GO's argument is based on the following analysis, summarised with comment from their presentation of their simple two-period model.

The RIVM-based intrinsic value estimate can be written as follows in terms of historical cost residual incomes:

$$B_0 + \frac{\tilde{y}_1}{1+r} + \frac{\tilde{y}_2}{(1+r)^2}, \quad (1)$$

where B_0 is the book value of assets at time 0, \tilde{y}_1 and \tilde{y}_2 are the expected (at time 0) historical cost residual incomes for times 1 and 2, respectively, and r is the cost of equity. This formulation of RIVM will yield a value estimate identical to that from the dividend capitalisation model if the book

value at time 2 (B_2 in GO) is treated as a terminal dividend. β_0 can be decomposed into p_0x and p_0u , being the book values of the assets to be consumed and depreciated at times 1 and 2, respectively. \tilde{y}_1 can be decomposed into the following components: (i) the revenues from the use of p_0x ($=2\sqrt{x}$), (ii) the depreciation of p_0x ($=-p_0x$), (iii) the residual income capital charge in respect of p_0x ($=-rp_0x$), and (iv) the residual income capital charge in respect of p_0u ($=-rp_0u$). Likewise, \tilde{y}_2 in (1) can be decomposed into the following components: (i) the revenues from the use of p_0u ($=2\sqrt{u}$), (ii) the depreciation of p_0u ($=-p_0u$), and (iii) the residual income capital charge in respect of p_0u ($=-rp_0u$). (The 'interest' earned at time 2 on the retained revenues of $2\sqrt{x}$ from time 1 cancels exactly against the capital charge on this item.) The intrinsic value estimate given in (1) can then be expanded as follows:

$$p_0(u+x) + \frac{2\sqrt{x} - (1+r)p_0x - rp_0u}{1+r} + \frac{2\sqrt{u} - (1+r)p_0u}{(1+r)^2}. \quad (2)$$

GO adapt (2) such that the income numbers are expressed on a current value basis, where holding gains accrue at the cost of equity, r , and where the holding gain on the unused assets at time 1 is therefore rp_0u . This gives rise to current value residual income at time 1 as follows:

$$\begin{aligned} & 2\sqrt{x} + rp_0u - p_0x - rp_0(u+x) \\ & = 2\sqrt{x} - (1+r)p_0x. \end{aligned} \quad (3)$$

The terms in the first line of (3) are, respectively, (i) the revenues from the use of p_0x , (ii) the holding gain on p_0u , (iii) the depreciation of p_0x , and (iv) the residual income capital charge in respect of $p_0(u+x)$. The current value residual income at time 2 is as follows:

$$\begin{aligned} & 2\sqrt{u} - p_0u(1+r) - rp_0u(1+r) \\ & = 2\sqrt{u} - (1+r)^2 p_0u. \end{aligned} \quad (4)$$

Here, the terms in the first line are, respectively, (i) the revenues from the use of p_0u , (ii) the depreciation of the time 1 current value of p_0u , and (iii) the residual income capital charge on the time 1 current value of p_0u . Since the current value residual incomes in (3) and (4) are constructed in accordance with CSR, the intrinsic value estimate can be written as follows in terms of those residual incomes:

$$p_0(u+x) + \frac{2\sqrt{x} - (1+r)p_0x}{1+r} + \frac{2\sqrt{u} - (1+r)^2 p_0u}{(1+r)^2}. \quad (5)$$

GO argue that, because rp_0u from the second term of (2) is absent in (5), the current value formulation avoids the need to keep track of unused assets

across accounting periods, and that this extra simplicity leads naturally to the use of current value residual income in valuation.

It should be noted that the absence of rp_0u in (5) results from the particular assumption that holding gains on p_0u accrue at the cost of equity, with the result that the capital charge and holding gain on this item cancel exactly. However, this cancelling is not a general property of current value residual income. If, as would be likely in practice, holding gains accrue at a rate other than r , the expression for the current value residual income at time 1 would be more complex than that for the corresponding historical cost residual income, because it would contain an additional holding gains term.

I now refer more generally to the complexities involved in working with valuation models that require the adjustment to another valuation basis of realisations and forecasts of accounting numbers that are initially presented in historical cost terms. O'Hanlon and Peasnell (2004) illustrate that, properly done, residual income-based valuation should yield identical value estimates regardless of whether historical cost, nominal current value or real current value accounting numbers are used. They also illustrate that, even in a simple setting, adjustment to a current value basis of readily available forecasts of historical cost accounting numbers can introduce a significant degree of unnecessary complexity into accounting-based valuation. Adjustment to reflect holding gains requires consistent adjustment to book values, depreciation charges and residual income capital charges, and inconsistency will give rise to valuation error.

Furthermore, the relationship between the growth rate for historical cost accounting numbers and that for corresponding current value accounting numbers is potentially complex, and the scope for material error is large. Any advantages that there might be in working with valuation models that require the adjustment of historical cost based numbers to another valuation basis need to be weighed against the potentially significant disadvantages of the added complexity and scope for error when it comes to practical implementation.

4. Summary

The task of delivering practically-applicable insights from the blending of the accounting-based valuation literature and the real options literature represents something of a challenge. Gietzmann and Ostaszewski have produced an ambitious and interesting study, which can act as a catalyst for further theoretical and empirical research. Subsequent developments in this literature might further distil the insights such that they are more easily applicable at a practical level by practitioners and/or by empirical researchers. As could be

expected from an approach that aims to be context-specific, the approach adopted by Gietzmann and Ostaszewski suggests that valuation models might better be based on numbers that incorporate elements of current value accounting. However, such valuation models bring their own problems at a practical level. In settings where accounting numbers and forecasts thereof are conventionally provided in historical cost terms, the use of a valuation model requiring the adjustment of these numbers to another valuation basis is likely to bring added complexity and scope for error. The benefits from using such a valuation model have to be carefully weighed against this.

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Dirty surplus accounting flows: international evidence

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Abstract—It has been suggested that dirty surplus accounting (violation of the clean surplus relationship (CSR)) may result in mismeasurement of performance and value, and that cross-country variation in dirty surplus accounting may cause particular problems for international comparisons. Using articulated data that are largely hand-collected, we evaluate the potential impact of dirty surplus accounting in France, Germany, the UK and the US for the period 1993–2001. First, we report summary statistics on dirty surplus accounting flows. These indicate that distributions of dirty surplus flows are often not centred on zero, and that there is significant cross-country variation in such flows. Then, we use a measure of multi-period abnormal performance to document the bias and inaccuracy, and cross-country variation therein, that would have arisen from omitting dirty surplus flows in measuring performance. Where significant bias and cross-country variation therein arise, they are largely caused by omission of goodwill-related flows, which regulators are eliminating as a dirty surplus item. In contrast, all classes of dirty surplus flow contribute to significant cross-country variation in inaccuracy. Finally, we address the issue of dirty surplus flows from the valuation perspective. We use the residual income valuation model, which relies partly on CSR, to test whether perfect-foresight forecasts of dirty surplus accounting flows explain beginning-of-interval market-to-book ratios after controlling for other inputs to the valuation model. We find little evidence to suggest that omission of dirty surplus flows from residual income value estimates would have caused systematic valuation errors in the period and countries examined.

1. Introduction

If accounting obeys the clean surplus relationship (CSR), net income includes all contemporaneous changes in the balance sheet value of equity other than issues and distributions of equity. Accounting which violates CSR is sometimes termed ‘dirty surplus accounting’, with omitted flows being termed ‘dirty surplus flows’. Dirty surplus accounting practices have been justified on the grounds that they help produce a performance measure that is focused on ‘normal operations’ and

has predictive ability (Black, 1993; Brief and Peasnell, 1996; Kiger and Williams, 1977). However, a number of authors have raised concerns that dirty surplus accounting might give rise to mismeasurement of performance and value, and that it might hinder the use of accounting numbers in cross-country comparisons. In this paper we present evidence relevant to these concerns by documenting the magnitude of dirty surplus accounting flows in France, Germany, the UK and the US over the period 1993–2001, and cross-country variation therein, within the context of accounting-based measures of performance and value.

In the countries and period covered by our study, a range of dirty surplus accounting practices can be observed. In the UK, dirty surplus practices have included goodwill write-offs (now abolished), revaluations, currency translation differences and prior-year adjustments. In France, items giving rise to dirty surplus flows have included goodwill write-offs, revaluations, currency translation differences, prior-year adjustments, subsidies, regulated provisions, consolidation adjustments, and changes in accounting policy resulting from new accounting regulations. In Germany, they have included goodwill write-offs, currency translation differences, prior-year adjustments, certain consolidation adjustments, and unrealised appreciation in investments. In the US, they have included unrealised gains on marketable securities, currency translation differences and minimum pension liability adjustments. In addition, merger

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accounting, which can be viewed as giving rise to a dirty surplus flow, was common practice in the US during the period under review, and was also used to a lesser extent in the UK.

Concerns about dirty surplus accounting flows have usually centred on their relative lack of transparency, which can create opportunities for earnings management and limit the usefulness of accounting flows in the measurement of periodic or multi-period performance (Paton, 1934; May, 1937; Littleton, 1940; Financial Accounting Standards Board, 1997:10; Johnson, Reither and Swieringa, 1995:132; Linsmeier et al., 1997:121). Concerns have also been raised in the context of business valuation. Since the equivalence between the dividend valuation model and the residual income valuation model (RIVM) relies on the assumption that forecasts obey CSR, dirty surplus accounting may interfere with the applicability of the RIVM (Linsmeier et al., 1997:121–122; Francis, Olsson and Oswald, 2000:47). It has been further suggested that cross-country variation in dirty surplus accounting may cause particular problems where accounting-based measures are used for international comparisons. For example, Frankel and Lee (1999:2) question whether cross-country variation in the severity of CSR violations may hinder international implementations of the RIVM.¹ In recent years, such concerns have prompted moves by accounting regulators to eliminate dirty surplus flows, or to require that they be reported more transparently. Examples of accounting standards or proposed standards that exemplify such moves include *FRS 3: Reporting Financial Performance* (Accounting Standards Board, 1992), *FRS 10: Goodwill and Intangible Assets* (Accounting Standards Board, 1997), *SFAS 130: Reporting Comprehensive Income* (Financial Accounting Standards Board, 1997) and *FRED 22: Reporting Financial Performance* (Accounting Standards Board, 2000). Also, an International Accounting Standards Board project on the reporting of financial performance has as its main focus the development of a single statement of comprehensive income, where comprehensive income is defined as the total change in equity from non-owner sources.

It is well known that dirty surplus accounting practices exist, that they vary across national accounting regimes, and that they arouse concerns regarding their impact on the usefulness of accounting numbers for performance measurement and valuation. However, there is little evidence as to the impact of such practices in settings where

accounting numbers are used. In this paper, we seek evidence relevant to concerns about dirty surplus accounting by exploring the magnitude of dirty surplus accounting flows and cross-country variation therein within the context of measures of performance and value. First we report summary statistics on dirty surplus flows. These show that the distributions of classes of dirty surplus flow are often not centred on zero, and that there is significant cross-country variation in such flows. Then, within the framework of an accounting-based measure that correctly measures multi-period abnormal performance provided accounting inputs obey CSR, we report the bias and inaccuracy that results from omitting various classes of dirty surplus flow in France, Germany, the UK and the US, and test for cross-country variation therein. We do so for measurement intervals of three and eight years during the period 1993–2001. Finally, we address the issue of dirty surplus accounting from a valuation perspective. We use RIVM-based regression models, where realisations of accounting flows are used as perfect-foresight forecasts, to examine the explanatory power of future dirty surplus flows for the market-to-book ratio in the four countries examined, after controlling for other inputs to the RIVM.

An important feature of our study is that it uses fully articulated data on book values, net capital contributions, net incomes and dirty surplus flows, which are largely hand-collected. Dirty surplus flows and complex capital transactions are sometimes disclosed opaquely in financial statements. Consequently, accounting databases sometimes fail to record such items, or misclassify them, or report some capital transactions together with some dirty surplus flows as a single figure within a sundry items category. This can make such databases potentially unreliable as a basis for cross-country studies of the magnitude of dirty surplus flows.

The results of our performance measure-based tests show that, where significant bias and cross-country variation therein arise, they are largely caused by the omission of goodwill-related flows, which regulators are eliminating as a dirty surplus item. Where significant cross-country variation in inaccuracy arises, the causes are more widespread, with all classes of dirty surplus flow contributing to the effect. In our RIVM-based tests, dirty surplus flows have little explanatory power for the market-to-book ratio, which suggests that omission of dirty surplus flows from RIVM value estimates would not have caused systematic valuation errors in the period and countries examined.

The remainder of the paper is organised as follows. Section 2 describes our research design, our sample and our data. Results are reported in Section 3. Section 4 concludes.

¹ Graham and King (2000) make a related point with regard to value-relevance studies, suggesting that cross-regime differences in CSR violations may contribute to cross-regime differences in the value relevance of accounting numbers.

2. Research design

In this section, we describe an accounting-based measure of abnormal performance and the closely-related RIVM, and explain how these will be used to gauge the potential impact of omitting dirty surplus flows. We then describe our sample and data.

2.1. An accounting-based measure of abnormal performance

O'Hanlon and Peasnell (2002) define a money-terms accounting-free measure of multi-period abnormal performance equal to the excess of (i) the economic value of a business at the end of a multi-period interval over (ii) an end-of-interval measure of invested capital. This accounting-free measure of abnormal performance is termed Excess Value Created (hereinafter, EVC). O'Hanlon and Peasnell (2002) show that EVC can be written as the terminal value of the realised clean surplus residual incomes arising during the multi-period interval, appropriately adjusted by the beginning-of-interval and end-of-interval differences between economic value and accounting book value. Since the identity between EVC and the residual income-based formulation thereof relies upon CSR, it provides a natural framework for observation of the effect of disregarding dirty surplus flows when using accounting flows to measure abnormal economic performance.

Using market value of equity as a measure of economic value, EVC from an equity perspective over a multi-period measurement interval beginning at time b and ending at time e , denoted EVC_e^b , is defined as follows:

$$EVC_e^b = MV_e - I_e^b, \quad (1)$$

where MV_e is market value at the end of the measurement interval and I_e^b is the end-of-interval measure of the capital invested by shareholders. (For ease of notation, company subscripts are suppressed where possible. Where no subscript appears, all variables should be interpreted as realisations for company i .) End-of-interval capital invested is defined as the beginning-of-interval market value of shareholders' equity less dividends (net of equity issues) paid during the interval, all inclusive of the required return thereon:

$$I_e^b = MV_b \prod_{k=1}^{e-b} (1 + r_{b+k}) - \sum_{s=1}^{e-b-1} DIV_{b+s} \prod_{k=1}^{e-(b+s)} (1 + r_{b+s+k}) - DIV_e, \quad (2)$$

where DIV denotes dividend net of equity issues and r denotes the cost of equity. Clean surplus

residual income for period $b+k$, denoted $RI_{CS,b+k}$, is defined as follows:

$$RI_{CS,b+s} = X_{CS,b+s} - r_{b+s} BV_{b+s-1}, \quad (3)$$

where BV denotes book value of equity and X_{CS} is clean surplus earnings defined as follows:

$$X_{CS,b+s} = DIV_{b+s} + (BV_{b+s} - BV_{b+s-1}). \quad (\text{CSR})$$

Re-arranging CSR as

$$BV_{b+s} = BV_{b+s-1} + X_{CS,b+s} - DIV_{b+s}$$

and substituting (3) into this rearranged formulation of CSR, the evolution of book value is as follows:

$$\begin{aligned} BV_{b+1} &= BV_b (1 + r_{b+1}) + RI_{CS,b+1} - DIV_{b+1} \\ BV_{b+2} &= BV_{b+1} (1 + r_{b+2}) + RI_{CS,b+2} - DIV_{b+2} \\ &= BV_b (1 + r_{b+1})(1 + r_{b+2}) - DIV_{b+1}(1 + r_{b+2}) \\ &\quad - DIV_{b+2} + RI_{CS,b+1}(1 + r_{b+2}) + RI_{b+2} \\ &\quad \dots\text{etc.} \end{aligned}$$

Generalising, the book value of shareholders' equity at the end of a multi-period interval starting at time b and ending at time e is

$$\begin{aligned} BV_e &= BV_b \prod_{k=1}^{e-b} (1 + r_{b+k}) \\ &\quad - \sum_{s=1}^{e-b-1} DIV_{b+s} \prod_{k=1}^{e-(b+s)} (1 + r_{b+s+k}) - DIV_e \\ &\quad + \sum_{s=1}^{e-b-1} RI_{CS,b+s} \prod_{k=1}^{e-(b+s)} (1 + r_{b+s+k}) + RI_{CS,e}. \end{aligned} \quad (4)$$

Substituting (2) and (4) into (1), the accounting-free EVC abnormal performance measure can be written as the terminal value of the within-interval clean surplus residual incomes, as adjusted by terms reflecting the beginning-of-interval and end-of-interval market-to-book premia:

$$\begin{aligned} EVC_e^b &= MV_e - I_e^b \\ &\equiv \sum_{s=1}^{e-b-1} RI_{CS,b+s} \prod_{k=1}^{e-(b+s)} (1 + r_{b+s+k}) + RI_{CS,e} \\ &\quad + (MV_e - BV_e) - (MV_b - BV_b) \prod_{k=1}^{e-b} (1 + r_{b+k}). \end{aligned} \quad (5)$$

The relationship in (5) relates directly to performance measures proposed by Stern Stewart and Co. within their Economic Value Added (EVA®) performance measurement system (Ehrbar, 1998; Young and O'Byrne, 2001).² EVA® is a special

² EVA® is a registered trademark of Stern Stewart and Co..

case of residual income, which Stern Stewart propose as a business performance measure to be used in determining executive remuneration. The cumulative residual income terms in (5),

$$\sum_{s=1}^{e-b-1} RI_{CS,b+s} \prod_{k=1}^{e-(b+s)} (1+r_{b+s+k}) + RI_{CS,e},$$

correspond to a multi-period measure of EVA®, which Stern Stewart propose as a basis for calculating executive bonuses.³ Further, the end-of-interval market-to-book premium corresponds to Stern Stewart's Market Value Added (MVA), which is proposed as a measure of wealth creation.⁴ Finally, the beginning-of-interval market-to-book premium corresponds to beginning-of-interval MVA, which can provide a basis for estimating beginning-of-interval expectations regarding future EVA®, against which within-interval EVA® outcomes can be compared.⁵

A measure of abnormal performance in which residual income is calculated as in (5) except for the omission, without any compensating correction, of a class (or classes) of dirty surplus flow may be written as follows:

$$(6) \quad EVC_{DS,e}^b = \sum_{s=1}^{e-b-1} (RI_{CS,b+s} - DS_{b+s}) \prod_{k=1}^{e-(b+s)} (1+r_{b+s+k}) + (RI_{CS,e} - DS_e) + (MV_e - BV_e) - (MV_b - BV_b) \prod_{k=1}^{e-b} (1+r_{b+k}),$$

where $EVC_{DS,e}^b$ is an erroneous measure of EVC for the multi-period interval from b to e , which omits dirty surplus flows, and DS denotes the omitted class or classes of dirty surplus flow. The error in measuring EVC is therefore equal to the terminal value at time e of the omitted dirty surplus flows arising in the interval from b to e , times minus one:

³ Ehrbar (1998, ch. 7), a senior vice-president of Stern Stewart and Co., argues that EVA®-based executive bonuses should not be paid immediately, but should be accumulated in a bonus bank. Bonuses should then be paid on the basis of the cumulative balance in the bonus bank. This is equivalent to using a multi-period accumulation of EVA® as a basis for calculating bonuses. However, Ehrbar does not suggest that 'interest' should be added to the bonus bank balance.

⁴ Ehrbar (1998, ch. 3) defines MVA as the excess of market value over adjusted book value, and argues that it is a measure of wealth creation. Young and O'Byrne (2001, ch. 2) correctly observe that MVA is not in itself a satisfactory performance measure.

⁵ Young and O'Byrne (2001, ch. 8) propose such a procedure. Their argument is based on the residual income valuation model, according to which the market-to-book premium is equal to the present value of expected future residual incomes.

$$EVC_{DS,e}^b - EVC_e^b = \quad (7)$$

$$- \left(\sum_{s=1}^{e-b-1} DS_{b+s} \prod_{k=1}^{e-(b+s)} (1+r_{b+s+k}) + DS_e \right).$$

We apply non-parametric tests to this measure, in order to seek evidence on the impact of omitting dirty surplus accounting flows in measuring abnormal performance, and cross-country variation therein.

2.2. The residual income valuation model (RIVM)

The estimate of the intrinsic value of a company's equity capital at time b , based on forecasts of future net dividends up to time e and a horizon term reflecting dividends after time e , is as follows (PVED: present value of expected dividends):

$$IV_b^e = \sum_{s=1}^{e-b} \left(\frac{E_b[DIV_{b+s}]}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{PVED_e}{\prod_{k=1}^{e-b} (1+r_{b+k})}, \quad (\text{PVED})$$

where:

- IV_b^e = estimate of intrinsic value at time b on the basis of forecasts up to time e ;
- $E_b[.]$ = time b expectations operator;
- $PVED_e$ = present value at time e of dividends expected to arise after time e (the horizon term, equal to the intrinsic value of the company at time e).

It is well known that substitution of (3) and CSR into PVED allows the intrinsic value estimate given by PVED to be expressed exactly equivalently by the RIVM:

$$\begin{aligned} IV_b^e &= \sum_{s=1}^{e-b} \left(\frac{E_b[DIV_{b+s}]}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{PVED_e}{\prod_{k=1}^{e-b} (1+r_{b+k})} \\ &\equiv BV_b + \sum_{s=1}^{e-b} \left(\frac{E_b[RI_{CS,b+s}]}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{PVECSRI_e}{\prod_{k=1}^{e-b} (1+r_{b+k})}, \end{aligned} \quad (\text{RIVM})$$

where $PVECSRI_e$ denotes the present value at time e of clean surplus residual incomes expected to arise after time e .

Our study uses the RIVM in conjunction with dirty surplus flows, for which forecasts are not readily available. We therefore use our realisations of accounting numbers as perfect-foresight forecasts within our RIVM-based analysis. A clean

surplus RIVM value estimate based on perfect-foresight forecasts is as follows:

$$\begin{aligned} IV_b^e &= \sum_{s=1}^{e-b} \left(\frac{DIV_{b+s}}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{MV_e}{\prod_{k=1}^{e-b} (1+r_{b+k})} \\ &\equiv BV_b + \sum_{s=1}^{e-b} \left(\frac{RI_{CS,b+s}}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{MV_e - BV_e}{\prod_{k=1}^{e-b} (1+r_{b+k})}, \end{aligned} \quad (8)$$

where the market value of equity at time e , MV_e , is the perfect-foresight forecast at time b of $PVED_e$, and $MV_e - BV_e$, the market-to-book premium at time e , is the perfect-foresight forecast at time b of $PVECSRI_e$. It should be emphasised that our need to use realisations as proxies for beginning-of-interval forecasts introduces measurement error, and that our results should be interpreted with this caveat in mind.^{6,7}

We use the formulation of RIVM given by (8) as a basis for testing whether perfect-foresight forecasts of dirty surplus flows are significant in explaining beginning-of-interval market values after controlling for perfect-foresight forecasts of dirty surplus residual income and the horizon value. Clean surplus residual income can be decomposed as follows:

$$RI_{CS,b+s} = RI_{DS,b+s} + TDSF_{b+s},$$

where RI_{DS} denotes dirty surplus residual income and $TDSF$ denotes total dirty surplus flows. This enables the perfect-foresight clean surplus RIVM to be written as the sum of (i) book value at time b , (ii) the present value at time b of dirty surplus residual incomes up to the horizon e , (iii) the present value at time b of dirty surplus flows up to the same horizon, and (iv) the present value at time b of the market-to-book premium at that horizon:

$$\begin{aligned} IV_b^e &= BV_b + \sum_{s=1}^{e-b} \left(\frac{RI_{DS,b+s}}{\prod_{k=1}^s (1+r_{b+k})} \right) \\ &\quad + \sum_{s=1}^{e-b} \left(\frac{TDSF_{b+s}}{\prod_{k=1}^s (1+r_{b+k})} \right) + \frac{MV_e - BV_e}{\prod_{k=1}^{e-b} (1+r_{b+k})}. \end{aligned} \quad (9)$$

⁶ In a comparison of cash flow- and earnings-based valuation methods, Penman and Sougiannis (1998) also use realisations as proxies for forecasts. However, their sample size is sufficiently large to enable the use of portfolios to alleviate the measurement error problem.

Division by BV_b gives

$$\begin{aligned} (IV_b^e / BV_b) &= 1 + PDRIB_b^e + \\ &\quad + PTDSFB_b^e + PHVB_e, \end{aligned} \quad (10)$$

where $PDRIB_b^e$ denotes the present value at time b of dirty surplus residual incomes arising up to the horizon e , scaled by book value at time b , $PTDSFB_b^e$ denotes the present value at time b of total dirty surplus flows arising up to the same horizon, scaled by book value at time b , and $PHVB_e$ denotes the present value at time b of the similarly scaled market-to-book premium at horizon e . Replacing the intrinsic value term in equation (10) by observed market value, and adding regression coefficients and an error term, gives rise to the following regression equation:

$$\begin{aligned} MTBR_{b,i} &= \alpha_0 + \alpha_1 PDRIB_{b,i}^e + \\ &\quad \alpha_2 PTDSFB_{b,i}^e + \alpha_3 PHVB_{e,i} + \varepsilon_{b,i}, \end{aligned} \quad (11)$$

where $MTBR$ denotes the market-to-book ratio, i is a company subscript, α_0 , α_1 , α_2 and α_3 are the regression coefficients and $\varepsilon_{b,i}$ is the error term. The significance or otherwise of the coefficient α_2 in regression model (11) indicates whether perfect-foresight forecasts of dirty surplus flows help explain beginning-of-interval market values after controlling for perfect-foresight forecasts of other inputs to the clean surplus RIVM, namely dirty surplus residual incomes and the horizon value. In order to maintain an acceptable sample size and minimise the measurement error caused by using subsequent realisations as proxies for expectations at time b , we apply regression model (11) to data for a three-year horizon ($e-b=3$) only. We remove extreme cases including those for which the book value at time b is negative. As well as reporting the results of applying model (11), we also report the results of univariate regressions of $MTBR_{b,i}$ on each of the explanatory variables individually, and the results of multivariate regressions of $MTBR_{b,i}$ on the dirty surplus residual income term and the dirty surplus flow term only.

2.3. Sample and data

Our analysis examines four countries: France, Germany, the UK and the US. These four countries

⁷ Note that, if a perfect-foresight RIVM value estimate were made as in (8) except that dirty surplus flows in the interval from b to e were omitted, the resulting value estimate would differ from the clean surplus-based value estimate in (8) by the present value at time b of the omitted dirty surplus flows. This difference is identical to the EVC error described in (7), except that it is the present value at time b of the omitted flows, rather than their terminal value at time e .

are economically significant and boast a substantial number of publicly quoted companies, and there has been substantial variation in the range of dirty surplus accounting practices within this group of countries in recent years. Also, a comprehensive archive of published financial statements is available for these countries (via Thomson Research). This latter point is important because of gaps and discrepancies in the available machine-readable data on changes in shareholders' funds, which make it necessary to collect substantial amounts of data manually to ensure that dirty surplus flows are correctly distinguished from capital transactions and are correctly classified. Our study is based on data from the period 1993–2001. Our start date is chosen because it coincides with the introduction by Datastream, our main machine-readable source for non-US accounting data, of the systematic provision of articulated data on dirty surplus flows.⁸

Our sample selection procedure for each country begins with the identification of all stock exchange-listed financial and non-financial companies for which data are available on either Datastream (in the case of the UK, France and Germany) or Compustat (in the case of the US) in 1997 (the mid-point of our test period). We retain financials because prior research indicates that dirty surplus flows in the US tend to be relatively significant in such companies (Dhaliwal et al., 1999:47). We control for differences in industry composition and in relative within-country company size by assigning companies in a given country to one of four broad industry categories (resources, basic and general industries and utilities; consumer goods; services, information and technology; financial) and one of four size categories.⁹ Five companies from each of the resulting 16 industry-size categories are then randomly selected to produce a final sample of 80 companies per country. In the cases of France and Germany, a number of our chosen companies switched from domestic GAAP to IAS or US GAAP during our test period. Such companies are removed from the sample and replaced by other companies from the appropriate

industry-size portfolio. This process is repeated until the French and German samples each contain 80 domestic GAAP companies. To limit the number of replacements to a manageable level, we treat as 'domestic GAAP companies' those companies that changed from domestic GAAP to IAS or US GAAP at the end of our test period (i.e., 2000 or 2001), omitting the last one or two periods in which domestic GAAP was not used. Finally, for each sample company we collect net income, book value and dirty surplus flow data for all available accounting periods within our nine-year test period. Companies with less than nine years of data are retained to avoid biasing the country samples towards established and surviving companies. Our final sample consists of 2,410 company-year observations for 320 companies. The distribution of observations across the four countries ranges from a high of 612 company-years for the UK to a low of 597 company-years for the US.

For each country for measurement intervals of three and eight years, we construct seven types of EVC error, as described in (7). Each error measures the effect of omitting one of the following seven classes of dirty surplus flow:

- Prior-year adjustments;
- Goodwill write-offs (net of write-backs);
- Issues of equity unrecognised due to merger accounting;
- Goodwill write-offs (net of write-backs) plus issues of equity unrecognised due to merger accounting, taken together;
- Asset revaluations;
- Other dirty surplus flows;
- All dirty surplus flows, equal to prior-year adjustments less goodwill write-offs less issues of equity unrecognised due to merger accounting plus asset revaluations plus other dirty surplus flows.

The issue of equity unrecognised due to merger accounting is included to ensure that our EVC measure and the accounting-based representation thereof reflect all issues of capital. We treat the item as part of the associated equity issue and as an exactly compensating write-off of part of the cost of the net assets 'acquired', akin to an immediate write-off of goodwill. In order to avoid inclusion of the same accounting data in more than one estimate for a given interval length, we report results based on non-overlapping intervals.¹⁰ Across the four countries, the total number of non-overlapping intervals is 738 for the three-year interval length ($e-b = 3$), and 197 for the eight-year interval length ($e-b = 8$).

We explore the impact of disregarding dirty sur-

⁸ The start of the systematic provision of such data was occasioned by the introduction in the UK of *Financial Reporting Standard 3: Reporting Financial Performance*, which required a more transparent reporting of dirty surplus items than had hitherto been required.

⁹ For non-financial companies size is measured by total sales (Datastream #104 for French, German and UK companies, and Compustat #12 for US companies). Since many financial companies do not report sales data, we measure size for such companies as the number of employees (Datastream #219 for French, German and UK companies, and Compustat #29 for US companies).

¹⁰ Our use of non-overlapping intervals introduces the potential for arbitrariness with respect to the start date of the intervals, but because of the length of our available data series (nine years), this problem is a minor one.

plus flows by computing signed and absolute cumulative abnormal performance measurement errors associated with the omission of each of the seven classes of dirty surplus flow. We scale these errors both by beginning-of-interval market value and by the absolute value of the true EVC measure (EVC_b). The first scaling procedure produces numbers that can be interpreted as errors in the measurement of the excess rate of return earned over the interval on the beginning-of-interval market value; the second can be interpreted as the proportionate error in the EVC measure.

Our empirical tests use fully articulated data on book values, net incomes, dirty surplus flows and net distributions. Accounting data are collected from Datastream (UK, France and Germany) and Compustat (US), with extensive reference to published financial statements.¹¹ The sources of periodic changes in shareholders' funds are assigned to one of three categories: net income, net capital distributions, and dirty surplus flows. The dirty surplus flow category is decomposed into the categories described above. Our accounting data is therefore structured as follows:

$$\begin{aligned} BV_{b+s} &= BV_{b+s-1} + X_{CS,b+s} - DIV_{b+s} \\ &= BV_{b+s-1} + NI_{b+s} + TDSF_{b+s} - DIV_{b+s} \\ &= BV_{b+s-1} + NI_{b+s} + PYA_{b+s} - GW_{b+s} - \\ &\quad - GM_{b+s} + AR_{b+s} + OTH_{b+s} - DIV_{b+s}, \end{aligned} \quad (12)$$

where:

- NI = net income;
 PYA = prior-year adjustments (i.e. differences between the opening book value of equity at the start of a period and the corresponding closing book value of equity at the end of the previous period);
 GW = goodwill written-off, net of goodwill written back on disposal;

¹¹ The components of changes in shareholders' funds reported by Datastream are based on data derived from the Statement of Movements in Shareholders' Funds required under UK GAAP as part of *Financial Reporting Standard (FRS) 3: Reporting Financial Performance* (Accounting Standards Board, 1992). Because FRS 3 (or any similar reporting requirement) does not apply to UK financial companies, or to French and German companies, most of the relevant items are coded as missing by Datastream for these companies. The only reliable source of articulated data on capital movements and components of dirty surplus flows that we are able to identify for such companies is the notes to their published financial statements.

¹² In a small number of cases, market value data were not available until shortly after the start of the first accounting period, so we used the first available data.

¹³ For the purposes of this table, we convert values expressed in £UK and \$US to euros using the average exchange rate from December 1992 to December 2001.

GM = issue of equity unrecognised due to merger accounting, measured as the excess of the market value of equity issued in respect of transactions accounted for as mergers over the increase in equity recognised in the financial statements in respect of the mergers;

AR = asset revaluations;

OTH = 'other dirty surplus flows' (including currency translation differences, unrealised gains on marketable securities, adjustments related to minimum pension liabilities, subsidies, and certain consolidation adjustments);

$TDSF$ = total dirty surplus flows, as previously defined, equal to $PYA - GW - GM + AR + OTH$;

and the other terms are as previously defined. The Appendix gives details of the Compustat and Datastream items used as the basis for construction of our articulated dataset.

Market value data are collected from Datastream and Compustat. The market value that we use is the market value at the balance sheet date adjusted by the total return on the company's stock for the three months after the balance sheet date, collected from Datastream.¹² This procedure ensures that the market value is likely to reflect information from the annual financial statements while remaining comparable with the balance sheet value of equity. The cost of equity for country j at time $b+s$ is estimated to be the 3-month Treasury Bill rate for country j for time $b+s$ plus an assumed constant risk premium of 5%. (Adjustment is made as appropriate for accounting periods that are of other than 12 months' duration.) This procedure allows the cost of equity to vary through time in line with interest rates, but assumes that all companies have a beta of one and that the market risk premium is constant at 5%. Our choice of 5% for the expected equity risk premium is based on recent evidence suggesting that its *ex-ante* value lies somewhere in the region of 4% to 6% (Copeland et al., 2000; Easton et al., 2002; Lamdin, 2002; O'Hanlon and Steele, 2000).

3. Results

3.1. Summary statistics

Table 1 (see p.396) reports summary statistics for the data used in our study for the pooled data and for each country separately. The figures for total dirty surplus flows and for dividends net of capital issues are each shown both inclusive and exclusive of the unrecognised issue of equity under merger accounting. Panel A reports mean and median values for the data items used in the analysis, in unscaled form in thousands of euros.¹³

Panel B reports the ratios of the aggregate items to the corresponding aggregate reported net income. These summary statistics suggest that, on average, total dirty surplus flows across all four countries, both inclusive and exclusive of the merger accounting item, are negative. The ratio of aggregate dirty surplus flows to aggregate net income varies substantially across countries. Exclusive (inclusive) of the merger accounting item, it is -1% (-106%) for US companies,¹⁴ -12% (-13%) for UK companies, -26% (-26%) for French companies and -32% (-32%) for German companies. In the UK, France and Germany, the largest contributor to total dirty surplus flows is goodwill. In these countries, the ratio of this negative item to net income is 17%, 26% and 22%, respectively.¹⁵ Other important classes of flow include prior-year adjustments in the UK (-4% of net income), revaluations in the UK (11% of net income), and 'other dirty surplus flows' in Germany (-9% of net income).

Panel C reports the means and medians of the individual company-year dirty surplus flows scaled by market value. For each item in each country, we report the results of non-parametric signed-rank tests of the null hypothesis that the distribution of the item is centred on zero. (Because of the relatively small samples used in this study, and the consequent potential for large outliers to be influential, all hypothesis tests reported in subsections 3.1 and 3.2 are non-parametric tests.) Rejections of the null hypothesis occur as follows: goodwill for the pooled sample and for France, Germany and the UK; unrecognised issues of equity under merger accounting for the pooled sample and for the US; asset revaluations for the pooled sample and for France and the UK; 'other dirty surplus flows' for the US; and total dirty surplus flows (both including and excluding the merger-related item) for the pooled sample, and for Germany and the US. Panel C also reports probability values for non-parametric Kruskal-Wallis tests of the null hypothesis of equality across countries in the mean rank of each class of scaled dirty surplus flow. The null hypothesis of equality of mean rank across countries is rejected at the 5% level for goodwill, merger-related flows, revaluations and total dirty surplus flows excluding the merger-related flow. Overall the statistics reported in Table 1 suggest

that, in some cases, the incidence of dirty surplus flows is significant and that there is significant cross-country variation in the nature and magnitude of these flows. In the following subsections, we examine the effect of the omission of dirty surplus flows in creating bias and inaccuracy in the EVC measure of abnormal performance, and cross-country variation therein, and test whether perfect-foresight forecasts of scaled dirty surplus flows are significant in explaining beginning-of-interval market-to-book ratios after controlling for other inputs to the RIVM.

3.2. Errors in measurement of abnormal performance from omission of dirty surplus flows

Table 2 (see p.398) reports the means and medians of the signed errors in EVC from omission of dirty surplus flows, for each class of dirty surplus flow and for each country. Panel A reports errors for the three-year measurement interval; Panel B reports those for the eight-year measurement interval. The errors are scaled both by beginning-of-interval market value and by the absolute value of the correct measure of EVC. The first scaling procedure gives the error in measurement of the excess rate of return on the beginning-of-interval market value; the second gives the proportionate error in the EVC measure. Each panel reports, for each country and for each dirty surplus EVC measure, the result of a non-parametric signed-rank test of the null hypothesis that the distribution of signed errors is centred on zero. Each panel also reports test statistics for non-parametric Kruskal-Wallis tests of the null hypothesis that the average rank of signed errors across countries is equal. This test is performed both for all four countries together, and for each paired combination of countries. In the former case, there are seven test statistics for both the market value-scaled errors and the EVC-scaled errors (seven classes of dirty surplus flow); in the latter case, there are 42 test statistics (seven classes of dirty surplus flow times six possible pairings of the four countries). Table 3 (see p.402) reports statistics for cross-country variation in the absolute errors.¹⁶

We consider first the signed errors reported in Table 2, dealing first with those for the three-year measurement interval and then with those for the eight-year interval. For the three-year interval, the null hypothesis that the distribution of errors is centred on zero is rejected for all dirty surplus flows in three cases for both the market value-scaled and EVC-scaled errors (Germany, UK, US). For goodwill, it is rejected in three cases for the market value-scaled errors (France, Germany, UK) and in two cases for the EVC-scaled errors (Germany and UK). For the merger-related item, it is rejected in one case for both the market value-scaled and EVC-scaled errors (US). For goodwill

¹⁴ It should be noted that, of the large numbers reported in respect of the merger-related item for the US, approximately 95% relates to one company that was involved in a number of large mergers during our test period. Without this company, the figures of €96,238,400 (mean in Panel A) and 1.0450 (aggregate scaled by aggregate net income in Panel B) would be reduced to €4,911,820 (mean) and 0.0534 (aggregate scaled by net income).

¹⁵ US companies have not been permitted to write off goodwill directly to equity.

¹⁶ We do not test the null hypothesis that the distribution of absolute errors is centred on zero.

inclusive of the merger-related item, it is rejected in all four cases for the market value-scaled errors, and in three cases for the EVC-scaled errors (Germany, UK, US). For asset revaluations, prior-year adjustments and 'other dirty surplus flows', it is never rejected. For both the market value-scaled and EVC-scaled errors, the null hypothesis of equality of mean rank in errors across all four countries is rejected for goodwill and goodwill inclusive of the merger-related item, but not in any other case. For the tests of equality of mean rank across pairs of countries, the rejections of the null hypothesis are very similar for both scaling methods. The null hypothesis of equality is rejected twice for all dirty surplus flows for both scaling methods (France/Germany, France/UK), five times for goodwill where scaling is by market value (France/Germany, France/UK, France/US, Germany/US, UK/US) and four times where scaling is by EVC (France/Germany, France/UK, Germany/US, UK/US), and four times for goodwill inclusive of the merger-related item for both scaling methods (France/Germany, France/UK, Germany/US, UK/US). No rejections arise in the case of asset revaluations, prior-year adjustments or other dirty surplus flows.

For the eight-year interval, the null hypothesis that the distribution of errors is centred on zero is rejected for all dirty surplus flows in two cases for both scaling methods (Germany, US). For goodwill, it is rejected in two cases for both scaling methods (Germany, UK). For the merger-related item, it is never rejected. For goodwill inclusive of the merger-related item, it is rejected in two cases for both scaling methods (Germany, UK). For asset revaluations, it is rejected once in the case of the EVC-scaled errors (UK). For prior-year adjustments it is never rejected. For 'other dirty surplus flows', it is rejected once for both scaling methods (UK). For both scaling methods, the null hypothesis of equality of mean rank in errors across all four countries is rejected for goodwill, the merger-related item and goodwill inclusive of the merger-related item, but not in any other case. For the tests of equality of mean rank across pairs of countries, the rejections of the null hypothesis are identical regardless of whether the errors are scaled by market value or EVC. For both scaling methods, the null hypothesis of equality is rejected four times for goodwill (France/Germany, France/UK, Germany/US, UK/US), twice for the merger-related item (France/US, Germany/US), four times for goodwill inclusive of the merger-related item (France/Germany, France/UK, Germany/US,

UK/US), and once for 'other dirty surplus flows' (Germany/UK).

The overall impression conveyed by Table 2 is that bias in the measures of abnormal performance caused by omission of dirty surplus flows, and cross-country variation therein, have arisen largely as a result of goodwill and the merger item, which is treated here similarly to a goodwill write off. The influence of asset revaluations, prior-year adjustments and 'other dirty surplus flows' in creating such effects has been relatively small.

We now consider the absolute errors reported in Table 3. In contrast with the effects observed in the signed errors, which are largely due to goodwill-related items, all classes of dirty surplus flow give rise to significant cross-country differences in absolute errors. For both scaling methods, all classes of dirty surplus flow give rise to at least four significant test statistics for the three-year interval and at least three significant test statistics for the eight-year interval.

We test the robustness of our results to variation in the methods used. We repeat our tests after estimating the cost of equity on the basis of assumed constant risk premia of 3% and 7%. We allow beta to vary across industry and country whilst assuming a market risk premium of 5%.¹⁷ We repeat our tests using a cost of capital of zero, in which case EVC becomes a measure of total money return that can be written in terms of aggregate clean surplus earnings plus the increase in the market-to-book premium over the interval. We test the robustness of our results to the use of six-year measurement intervals. In all cases, the overall pattern of our results remains unchanged.

Overall, these results indicate that significant bias in EVC estimates and cross-country variation therein is largely limited to the effect of goodwill-related items, but that cross-country variation in inaccuracy is attributable to all classes of dirty surplus flow. The problem posed by the goodwill-related items in this context is being removed as regulators restrict the use of merger (pooling of interests) accounting and require that goodwill be capitalised and depreciated (or subjected to periodic impairment tests).

3.3. Explanatory power of perfect-foresight dirty surplus flows for market-to-book ratios

Our regression models test whether three-year-horizon perfect-foresight forecasts of aggregate dirty surplus flows explain variation in the market-to-book premium beyond that explained by other inputs to a perfect-foresight RIVM. We estimate our regression models for the pooled data for all four countries examined and for each country separately. The data used in the regression models are those used in the tests reported in Tables 2 and 3 except that, for the overall data set and for each

¹⁷ In allowing beta to vary across industries and across countries, we use as the beta for industry m in country j the median of the betas collected from Datastream in early 2004 for all companies in industry m in country j .

country, we eliminate cases in which book value at time b is negative and cases in which one or more of the regression variables falls in the most extreme 2% of the distribution for that variable. Descriptive statistics for the data used in the regression models are given in Table 4 (see p.406).

The results from our regression models are given in Table 5 (see p.407). Panel A reports the pooled results, and Panels B, C, D and E report separate results for France, Germany, the UK and the US, respectively. Within each panel, the first row reports the results of the full regression model in which $MTBR_{b,i}$ is regressed on the dirty surplus residual income term, the dirty surplus flow term and the horizon market-to-book premium term. The second row reports the results of a regression of $MTBR_{b,i}$ on the dirty surplus residual income term and the dirty surplus flow term only. The third, fourth and fifth rows of each panel report the results of univariate regressions of $MTBR_{b,i}$ on each of the explanatory variables individually.

There is little evidence that perfect-foresight forecasts of dirty surplus flows help to explain variation in the market-to-book ratio. The coefficient on the dirty surplus flow term is positive and significantly different from zero in only one of the multivariate regressions in which it appears (for the full model for the UK), and is never positive and significantly different from zero in any of the corresponding univariate regressions. This contrasts with the pattern for perfect-foresight forecasts of dirty surplus residual income. The coefficient on this term is positive and significantly different from zero in one case for the full model (UK), in three cases for the model in which it appears with dirty surplus flows only (all countries, France and the UK), and in three cases for the univariate model (all countries, France and the UK). In all panels except that for the US, where both statistics are close to zero, the adjusted R-squared statistic for the univariate regression containing dirty surplus residual income is higher than that for the corresponding univariate regression containing dirty surplus flows. We also note that in all regression models the horizon term is always highly significant, and that the adjusted R-squared statistics for the models containing the horizon term are substantially higher than for the corresponding models that do not. The importance of the horizon term in explaining the market-to-book ratio is to be expected in the light of the finding by Penman (1996) that the market-to-book ratio is highly positively associated with future residual incomes for several years ahead, which is consistent with a high degree of persistence in the market-to-book ratio. Finally, we note that, in each of the ten multivariate regressions and in each of the 15 univariate regressions, the intercept term is significantly larger than one.

Because extreme observations are not uniformly distributed across countries, deletion of the 2% most extreme observations for single countries causes some extreme cases that are trimmed from the pooled data to remain within the single-country data. For this reason, we also run our single-country regression tests after trimming cases in which one or more of the regression variables falls in the most extreme 4% of the distribution for that variable (results not tabulated). This does not materially change our results. We also repeat our tests for data in which the cost of equity used to discount the perfect-foresight forecasts is calculated using the country-industry betas referred to earlier (results not tabulated). Again, this does not materially change our results. Furthermore, we estimate models in which the dirty surplus flow term is split into the components referred to in subsection 3.2. Again the inferences drawn from our results do not change.

Overall there is little evidence from our results that perfect-foresight forecasts of dirty surplus flows help explain variation in the market-to-book ratio in the countries and period that we consider. This suggests that omission of dirty surplus flows from RIVM value estimates is unlikely to have given rise to systematic errors in value estimates. This finding is consistent with studies that have found low association between dirty surplus flows and contemporaneous stock returns (Dhaliwal et al., 1999; O'Hanlon and Pope, 1999). We must, however, emphasise that our results are subject to the caveat referred to earlier regarding our use of realisations as proxies for beginning-of-interval forecasts.

4. Conclusion

For decades, dirty surplus accounting practices have been a source of misgivings among accounting researchers and accounting regulators. It is well known that such practices can result in the exclusion from net income of potentially material flows, and that the incidence of such excluded flows can vary across GAAP regimes. However, there is little evidence as to whether such practices, and cross-country variation therein, actually matter in a practical context. This study provides some evidence in this regard by examining the impact of dirty surplus accounting practices in contexts where theory explicitly suggests that they could matter, namely an accounting-based performance measure and the residual income valuation model. It does so for France, Germany, the UK and the US for the period 1993–2001.

First, we report summary statistics on dirty surplus flows. These indicate that the distributions of classes of dirty surplus flow are often not centred on zero, and that there is significant cross-country variation in these flows. We then explore the potential impact of dirty surplus accounting flows in the context of performance measurement. We use

an accounting-free measure of multi-period abnormal performance that can be correctly written in terms of within-interval residual incomes if all dirty surplus flows are included, but which will give rise to error if dirty surplus flows are omitted. We examine the effect of the omission of various classes of dirty surplus flow in creating bias and inaccuracy in this measure of abnormal performance. As regards bias, the effects and cross-country variation therein are largely limited to goodwill-related flows, which regulators are eliminating as a dirty surplus item. As regards inaccuracy, we find that all classes of dirty surplus flow give rise to some significant cross-country variation. Finally, we use a regression model based on the residual income valuation model, which relies in part on the assumption that forecasts of accounting numbers obey the clean surplus relationship, to test whether perfect-foresight forecasts of dirty surplus accounting flows explain beginning-of-interval market-to-book ratios after controlling

for the other perfect-foresight inputs to the valuation model. Here, we find little evidence to suggest that omission of dirty surplus flows from residual income value estimates would have given rise to systematic valuation errors. We must emphasise that our residual income valuation model-based results are subject to a caveat regarding our use of realisations as proxies for beginning-of-interval forecasts. More generally, we must also emphasise that the results of our study provide evidence as to the effect of disregarding dirty surplus flows in a particular nine-year period, and that a different period in which economic circumstances are markedly different might produce different results. Subject to these caveats, our results suggest that omission of dirty surplus flows may cause problems as regards the accuracy of performance measures, but do not suggest that dirty surplus flows should be a significant problem as regards bias in such performance measures or in the application of the residual income valuation model.

Appendix

Data on movements in shareholders' funds

This appendix explains the methods used to construct our fully articulated data on net income, dirty surplus flows, book values and net capital contributions. Our data are constructed such that all changes in book value of equity are assigned either to net income, dividend (net of equity issues), or a class of dirty surplus flows, as described by equation (12) in the text. Since components of dirty surplus flows and disclosure requirements vary across countries, different data collection procedures are required for different countries. The following sections outline the procedures used for each of the four countries examined.

A.1. US data

Based on previous attempts to measure dirty surplus items in the US (e.g., Dhaliwal et al., 1999; Hand and Landsman, 1998; Biddle and Choi, 2002), data are collected within the following framework (Compustat items in parentheses):

$$\begin{aligned} BV_{b+s} = & BV_{b+s-1} + NI_{b+s} - D_{b+s} + CST_{b+s} \quad (\text{A.1}) \\ & + CSU_{b+s} - TRS_{b+s} + CUR_{b+s} \\ & + MSEC_{b+s} + PEN_{b+s} + DIF_{b+s} \\ & + GM_{b+s} - GM_{b+s}, \end{aligned}$$

where:

BV = Book value of common shareholders' funds (#60);

NI	= Net income (#172) after deducting preferred dividends (#19);
D	= Common dividends (#21);
CST	= Movements in common stock (Δ #85);
CSU	= Movements in capital surplus (Δ #210);
TRS	= Movements in treasury stock (Δ #88);
CUR	= Adjustment for foreign currency translation (Δ #230);
$MSEC$	= Adjustment for marketable securities (Δ #238); ¹⁸
PEN	= Adjustment for pension liabilities: measured as the change in additional minimum pension liability in excess of unrecognised prior service costs (#297 – #298, if negative); ¹⁹
DIF	= Other movements in shareholders' funds, measured as the difference between the flows referred to above and the change in book value between the end of the prior period and the end of the current period, as reported by Compustat. Because this residual item may include both capital transactions (including

¹⁸ In some cases we observe that Compustat items #230 and #238 are not in accordance with the published financial statements. Where necessary, we correct Compustat data #230 and #238 to be in accordance with the figures reported in the financial statements.

¹⁹ This calculation operationalises pension costs in accordance with SFAS130, section P16, para. 131.

changes in the book value of equity due to mergers) and dirty surplus items, we investigate its nature in each case by checking the published financial statements and reclassifying *DIF* where appropriate;

GM = Issue of equity unrecognised due to merger accounting.

The last item listed above, issue of equity unrecognised due to merger (pooling-of-interests) accounting, enters (A.1) twice, once as a positive item to be treated as part of equity issues, and once as a negative item to be treated as a negative dirty surplus flow akin to a write-off of purchased goodwill. This item is equal to the excess of (i) the proceeds of the share issue related to the merger, estimated by reference to data from CRSP on numbers of shares in issue and share price, over (ii) the increase in the book value of equity relating to the merger, as obtained by inspection of the financial statements.

The net income item in equation (12) in the text (*NI*) comprises the corresponding item in (A.1). The prior-year adjustment item (*PYA*) comprises components of *DIF* in (A.1) that we identify as relating to prior-year adjustments. The item described as 'issue of equity unrecognised due to merger accounting' (*GM*) comprises the corresponding item in (A.1). The 'other dirty surplus flows' item (*OTH*) comprises the following items from (A.1): *CUR*, *MSEC*, *PEN*, and certain components of *DIF*. The item described in the text as 'dividend net of equity issues' (*DIV*) comprises the following items from (A.1): *D* plus *TRS* less *GM* less *CST* less *CSU*. Goodwill write-offs and asset revaluations are not permitted in the US.

A.2. UK data

UK data are collected within the following framework (Datastream items in parentheses):

$$\begin{aligned} BV_{b+s} &= BV_{b+s-1} + NI_{b+s} - D_{b+s} \\ &\quad + CAP_{b+s} + PYA_{b+s} - GW_{b+s} \\ &\quad + AR_{b+s} + OTHER_{b+s} + OCBV_{b+s} \\ &\quad + GM_{b+s} - GM_{b+s}, \end{aligned} \tag{A.2}$$

where:

BV = Book value of ordinary shareholders' funds. This is obtained from Datastream for non-financials (#1107), and collected manually from published financial statements for financials. The book value is adjusted to include the creditor for ordinary dividend payable;²⁰

<i>NI</i>	= Net income. Obtained from Datastream for non-financials (#1087) and collected manually from published financial statements for financials;
<i>D</i>	= Ordinary dividends (#187), less the increase in the creditor for ordinary dividend payable (see definition of <i>BV</i> above);
<i>CAP</i>	= Capital issues (exclusive of movements in non-common capital). Obtained from Datastream for non-financials (#1101 - [Δ #306 + Δ #302]) and collected manually from published financial statements for financials;
<i>PYA</i>	= Prior-year adjustments. Identified from Datastream in the case of non-financials and collected manually from published financial statements for financials;
<i>GW</i>	= Goodwill written-off, net of goodwill written back on disposal. Obtained from Datastream for non-financials (#1103 - #1102) and collected manually from published financial statements for financials;
<i>AR</i>	= Asset revaluations. Obtained from Datastream for non-financials (#1099) and collected manually from published financial statements for financials;
<i>OTHER</i>	= Other flows. Obtained from Datastream for non-financials (#1098 + #1100) and collected manually from published financial statements for financials;
<i>OCBV</i>	= Other changes in book value. This Datastream category (#1104) comprises both dirty surplus flows and capital items. All items in this category are reclassified by the authors, either to 'other dirty surplus flows' or to 'capital issues';
<i>GM</i>	= Issue of equity unrecognised due to merger accounting.

The issue of equity unrecognised due to merger (pooling-of-interests) accounting is dealt with as with the US data. In the case of the UK, the proceeds of the share issue related to the merger are estimated by reference to data on numbers of shares in issue and share price obtained from

²⁰ Market value at year-end reflects the cum-dividend value of the company at that date but, in accordance with UK GAAP, UK companies report year-end book value net of dividends payable. In order to make book value consistent with market value, we estimate the creditor for ordinary dividend by multiplying the total dividend creditor by the ratio of (i) ordinary dividend charged in the year to (ii) total dividend charged in the year.

Datastream.

The items described in equation (12) in the text as net income (*NI*), prior-year adjustments (*PYA*), goodwill (*GW*), issue of equity unrecognised due to merger accounting (*GM*) and asset revaluations (*AR*) comprise the corresponding items from (A.2). The 'other dirty surplus flows' item (*OTH*) comprises *OTHER* and certain components of *OCBV* from (A.2). The item described in the text as 'dividend net of equity issues' (*DIV*) comprises the following items from (A.2): *D* less *CAP* less *GM* less certain components of *OCBV*.

A.3. French and German data

The framework used for collection of data for French and German companies is the same as that represented in equation (A.2), except for two items. First, as no instances of the use of merger accounting arise in our data for either country, the item denoted *GM* is omitted here. Second, there is an additional term (*EUR*) that captures small changes in book value arising from the introduction of the single currency in January 1999, where Datastream converts all pre-1999 data reported in domestic currencies into euros using a fixed exchange rate.²¹ The framework for France and Germany is therefore as follows:

$$\begin{aligned} BV_{b+s} = & BV_{b+s-1} + NI_{b+s} - D_{b+s} \\ & + CAP_{b+s} + PYA_{b+s} - GW_{b+s} \\ & \dots \\ & + AR_{b+s} + OTHER_{b+s} \\ & + OCBV_{b+s} + EUR_{b+s}. \end{aligned} \quad (\text{A.3})$$

Many of the data for French and German companies are manually collected from published annual reports.

The item *OTHER* in equation (A.3) represents one of the more material dirty surplus flow categories for French and German companies. For French companies, this category includes items such as currency translation differences, subsidies, regulated provisions (provisions or reserves required by regulators for taxes, pensions and retirement purposes), consolidation adjustments and

changes in accounting policies as a result of new accounting regulations (for example CRC 99-02²²). For German companies, it includes unrealised appreciation in investments and various consolidation adjustments.

Notes to German financial statements are sometimes vague about the types of transaction that generate movements in shareholders' funds. This often limits our ability to decompose aggregate dirty surplus flows for German companies into their constituent components. In addition, German companies' balance sheets sometimes include 'special items with a reserve component',²³ for which no consensus appears to exist regarding whether they should be treated as equity or liabilities. Some authors consider them to be a mixed item, part liability and part equity (TRANSACC 2001:1,287); the financial reports themselves often do not clearly indicate which category such items belong to; and commercial databases deal with them in different ways.²⁴ The results reported in this study are based on data that exclude such items from shareholders' funds. However, given the lack of consensus on how to deal with them, we check that our results are not sensitive to inclusion of these items within shareholders' funds (with movements therein being treated as 'other dirty surplus flows').

As with the UK, the items described in equation (12) in the text as net income (*NI*), prior-year adjustments (*PYA*), goodwill (*GW*) and asset revaluations (*AR*) comprise the corresponding items from (A.3). The 'other dirty surplus flows' item (*OTH*) comprises *OTHER*, *EUR* and certain components of *OCBV* from (A.3). The item described in the text as 'dividend net of equity issues' (*DIV*) comprises the following items from (A.3): *D* less *CAP* less certain components of *OCBV*.

²¹ We use the same exchange rate to convert data that are manually collected from financial statements published in domestic currencies.

²² This regulation deals with consolidation issues.

²³ Such items often result from differences between tax accounting and financial accounting. They can also include government grants, pension movements, and tax benefits from promoting regional economic development.

²⁴ For example, Datastream's shareholders' equity (#2018) excludes such items, whereas Worldscope's includes them.

Table 1
Summary statistics

Panel A: Mean (median) values of primary variables ('000s of euros)

Country	Number of company-years	Market value	BV_{t-1}	NI_t	Accounting flows during accounting period t		
					DIV_t excluding GM_t	DIV_t including GM_t	PYA_t
All	2,410	1,322,922.14 (117,856.83)	484,789.75 (52,201.25)	61,567.29 (5,011.50)	-23,890.09 (613.04)	-47,773.37 (611.04)	-322.19 (0.00)
France	598	1,984,302.33 (230,551.50)	880,414.83 (150,668.00)	98,701.35 (13,142.50)	-50,393.74 (2,013.00)	-50,393.74 (2,013.00)	5.63 (0.00)
Germany	603	873,670.37 (93,055.00)	362,348.27 (33,042.00)	32,275.00 (3,626.00)	-15,237.10 (1,076.00)	-15,237.10 (1,076.00)	-295.40 (0.00)
UK	612	500,641.11 (43,448.71)	191,596.85 (22,544.02)	24,363.36 (2,198.99)	2,709.93 (516.51)	2,539.35 (516.51)	-957.73 (0.00)
US	597	1,957,142.32 (121,757.37)	512,733.56 (54,624.06)	92,096.43 (4,584.48)	-33,350.33 (-20.93)	-129,588.73 (-20.93)	-26.09 (0.00)

Panel B: Aggregate of items scaled by aggregate net income

All	7.8741	1.0000	-0.3880	-0.7759	-0.0052
France	8.9200	1.0000	-0.5106	-0.5106	0.0001
Germany	11.2269	1.0000	-0.4721	-0.4721	-0.0092
UK	7.8641	1.0000	0.1112	0.1042	-0.0393
US	5.5674	1.0000	-0.3621	-1.4071	-0.0003

Panel C: Individual dirty surplus flow observations scaled by market value and tests of cross-country variation

Country	PYA_t
All	Mean 0.0000 Median 0.0000
France	Mean 0.0000 Median 0.0000
Germany	Mean 0.0007 Median 0.0000
UK	Mean -0.0005 Median 0.0000
US	Mean -0.0002 Median 0.0000
p-value for difference ^a	0.344

Notes to Table 1

a. Notation is as follows: BV denotes book value of ordinary shareholders' funds, NI denotes net income, DIV denotes dividends net of capital issues (positive (negative) sign denotes a positive (negative) net dividend), PYA denotes prior-year adjustments, GW denotes goodwill written off (less written back), GM denotes the unrecognised issue of equity under merger accounting, AR denotes asset revaluations, OTH denotes 'other dirty surplus flows', $TDSF$ excluding GM denotes total dirty surplus flows exclusive of the merger-related item ($= PYA - GW + AR + OTH$), $TDSF$ including GM denotes total dirty surplus flows inclusive of the merger-related item ($= PYA - GW - GM + AR + OTH$). Subscripts $t-1$ and t denote the beginning and end of the accounting period. For each

Accounting flows during accounting period t

GW_t	GM_t	AR_t	OTH_t	$TDSF_t$ excluding GM_t	$TDSF_t$ including GM_t	BV_t
9,152.86 (0.00)	23,883.28 (0.00)	383.02 (0.00)	-885.85 (0.00)	-9,977.88 (0.00)	-33,861.16 (0.00)	560,269.25 (58,527.38)
25,590.58 (0.00)	0.00 (0.00)	-1,121.56 (0.00)	1,174.39 (0.00)	-25,532.12 (0.00)	-25,532.12 (0.00)	1,003,977.80 (164,379.00)
6,967.45 (0.00)	0.00 (0.00)	0.00 (0.00)	-3,049.96 (0.00)	-10,312.81 (0.00)	-10,312.81 (0.00)	399,547.56 (35,281.00)
4,172.96 (0.00)	170.58 (0.00)	2,604.18 (0.00)	-495.33 (0.00)	-3,021.84 (0.00)	-3,192.42 (0.00)	210,228.44 (25,981.38)
0.00 (0.00)	96,238.40 (0.00)	0.00 (0.00)	-1,164.01 (0.00)	-1.190,10 (0.00)	-97,428.50 (0.00)	636,990.22 (62,250.63)
0.1487	0.3879	0.0062	-0.0144	-0.1621	-0.5500	9.1000
0.2593	0.0000	-0.0114	0.0119	-0.2587	-0.2587	10.1719
0.2159	0.0000	0.0000	-0.0945	-0.3196	-0.3196	12.3794
0.1713	0.0070	0.1069	-0.0203	-0.1240	-0.1310	8.6289
0.0000	1.0450	0.0000	-0.0126	-0.0129	-1.0579	6.9166

Accounting flows during accounting period t

GW_t	GM_t	AR_t	OTH_t	$TDSF_t$ excluding GM_t	$TDSF_t$ including GM_t
0.0086	0.0024	0.0017	0.0012	-0.0057	-0.0081
0.0000*	0.0000*	0.0000*	0.0000	0.0000*	0.0000*
0.0067	0.0000	-0.0001	0.0009	-0.0059	-0.0059
0.0000*	0.0000	0.0000*	0.0000	0.0000	0.0000
0.0118	0.0000	0.0000	0.0014	-0.0097	-0.0097
0.0000*	0.0000	0.0000	0.0000	0.0000*	0.0000*
0.0155	0.0012	0.0066	-0.0002	-0.0096	-0.0108
0.0000*	0.0000	0.0000*	0.0000	0.0000	0.0000
0.0000	0.0083	0.0000	0.0027	0.0025	-0.0058
0.0000	0.0000*	0.0000	0.0000*	0.0000*	0.0000*
<0.001	<0.001	0.001	0.307	0.025	0.307

row of aggregate and mean statistics, opening book value plus net income less net dividends plus total dirty surplus flows equals closing book value.

- b. Data for the UK and the US in Panel A are converted to euros using the average exchange rate from December 1992 to December 2001.
- c. In Panel C, * against the median indicates that one can reject at the 5% level the null hypothesis that the distribution is centred on zero (signed-rank test).
- d. Probability values based on a Kruskal-Wallis test of the null hypothesis of equality of mean rank across the four countries.

Table 2
Signed errors from measurement of excess value created (EVC) omitting dirty surplus flows (errors scaled by beginning-of-interval market value and absolute value of EVC)

Panel A: 3-year measurement interval ($e-b = 3$)

		Scaled by beginning market value ^a				Scaled by absolute value of EVC ^a			
		France	Germany	UK	US	France	Germany	UK	US
		178	180	191	189	178	180	191	189
ALL	Mean	0.0165	0.0726	0.1195	0.0495	0.0718	4.4100	0.0771	0.3951
	Median	0.0000	0.0000*	0.0040*	0.0000*	0.0000*	0.0000*	0.0040*	0.0000*
<i>Pairs^c:</i>									
France	Mean	0.023	0.038	0.139	0.051	0.015	0.036	0.076	
	Germany		0.489	0.190	0.133		0.829	0.285	
	UK							0.304	
GW	Mean	0.0154	0.0758	0.1339	0.0000	0.0157	4.0754	0.2081	0.0000
	Median	0.0000*	0.0000*	0.0000*	0.0000	<0.001	0.0000*	0.0000*	<0.001
<i>Pairs^c:</i>									
France	Mean	<0.001	0.031	0.042	<0.001	<0.001	0.026	0.093	
	Germany		0.891	0.003	0.003		0.562	<0.001	
	UK							0.003	
GM	Mean	0.0000	0.0000	0.0059	0.0538	0.0000	0.0068	0.3858	0.059
	Median	0.0000	0.0000	0.0000	0.0000*	0.058	0.0000	0.0000	0.0000*
<i>Pairs^c:</i>									
France	Mean	1.000	0.334	0.088	0.0000	1.000	0.334	0.088	
	Germany		0.332	0.086	0.155		0.332	0.086	
	UK							0.156	
GW+GM	Mean	0.0154	0.0758	0.1398	0.0538	0.0157	4.0754	0.2149	0.3858
	Median	0.0000*	0.0000*	0.0000*	0.0000*	<0.001	0.0000*	0.0000*	<0.001
<i>Pairs^c:</i>									
France	Mean	<0.001	0.018	0.819	0.0000	<0.001	0.016	0.963	
	Germany		0.965	<0.001	0.016		0.683	<0.001	
	UK							0.017	
		All four ^b				All four ^b			
		738				738			

Table 2 (*continued*)

PAIR		Pairs ^c :		France		Germany		UK			
		Mean	Median								
Pairs ^c :											
PAIR		0.0005	0.0000	-0.0206	0.0000	0.0006	0.0000	-0.1459	0.0000	0.0000	0.641
PAIR		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
PAIR		0.0000	0.0000	0.702	0.406	0.695		0.250	0.360	0.239	
PAIR		0.0000	0.0000	0.474	0.474	1.000		0.563	1.000	0.555	
PAIR		0.0000	0.0000	0.464	0.464						
PAIR		0.0000	0.0000	0.0011	0.0018	0.0011	0.0000	-0.0030	0.0030	0.0009	0.708
PAIR		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
PAIR		0.0000	0.0000	0.655	0.366	1.000		0.655	0.476	1.000	
PAIR		0.0000	0.0000	0.308	0.722	0.400		0.411	0.724	0.507	
PAIR		0.0000	0.0000	0.400	0.400						
PAIR		0.0007	0.0000	-0.0021	-0.0016	-0.0055	0.0555	0.3377	0.0051	0.0084	
PAIR		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.254
PAIR		0.0000	0.0000	0.415	0.178	0.158	0.426	0.0000	0.0000	0.0000	
PAIR		0.0000	0.0000	0.428	0.428	0.554		0.398	0.080	0.110	
PAIR		0.0000	0.0000	0.697	0.697			0.299	0.479	0.479	
PAIR		0.0000	0.0000					0.660	0.660	0.660	

Panel B: 8-year Measurement Interval ($e-b = 8$)

Table 2
Signed errors from measurement of excess value created (EVC) omitting dirty surplus flows (errors scaled by beginning-of-interval market value and absolute value of EVC) (*continued*)

Panel B: 8-year measurement interval ($e-b = 8$)

Table 2 (continued)

OTH	<i>Mean</i>	-0.0129	0.0133	0.0159	-0.0852	0.0199	-0.2035	4.1428	-0.7705
	<i>Median</i>	0.0007	0.0000	0.0048*	0.0000	0.0094	0.0006	0.0000	0.0000
<i>Pairs^c:</i>									
France		0.586	0.084	0.864	0.273	0.260	0.912		
Germany			0.025	0.197			0.159		
UK				0.080			0.170		

Notes to Table 2

a. This table reports mean and median signed differences between EVC measures over the interval from b to e , calculated exclusive of dirty surplus flows and denoted $EVC_{DS,e}^b$ and the correct EVC measure denoted EVC_e^b , as given by equation (7) in the text:

$$(7) \quad EVC_{DS,e}^b - EVC_e^b = - \left(\sum_{k=1}^{e-b-1} DS_{b+k} \prod_{t=k+1}^{e-(b+k)} (1 + r_{b+t+k}) + DS_e \right).$$

Panel A reports these errors for three-year measurement intervals ($e-b=3$); Panel B reports these errors for eight-year measurement intervals ($e-b=8$). The errors in measurement of EVC are scaled both by market value at the start of the measurement interval (left side of each panel) and by the absolute value of the correct EVC measure (right side of each panel). The various dirty surplus-based measures differ from each other with respect to the classes of dirty surplus flow that are omitted. Details are as follows:

- ALL: all dirty surplus flows are omitted;
- GW: goodwill only is omitted;
- GM: the unrecognised issue of equity under merger (pooling-of-interests) accounting only is omitted;
- GW+GM: both goodwill and the unrecognised issue of equity under merger (pooling-of-interests) accounting are omitted;
- AR: asset revaluations only are omitted;
- PYA: prior-year adjustments only are omitted;
- OTH: 'other dirty surplus flows' only are omitted.

*against the median indicates that one can reject at the 5% level the null hypothesis that the distribution is centred on zero (signed-rank test). In these cases, the median is printed in bold type.

b. Probability value for a Kruskal-Wallis test of the null hypothesis of equality of mean rank in signed errors across all four countries. Probability values of 0.05 (5%) or less are printed in bold type.

c. Probability value for a Kruskal-Wallis test of the null hypothesis of equality of mean rank in signed errors across pairs of countries. Probability values of 0.05 (5%) or less are printed in bold type.

Table 3
Absolute values of errors from measurement of excess value created (EVC) omitting dirty surplus flows (errors scaled by beginning-of-interval market value and absolute value of EVC)

Panel A: 3-year Measurement interval ($e-b = 3$)

Table 3 (*continued*)

Panel B: 8-year measurement interval ($e-b = 8$)

Table 3
Absolute values of errors from measurement of excess value created (EVC) omitting dirty surplus flows (errors scaled by beginning-of-interval market value and absolute value of EVC) (continued)

Panel B: 8-year measurement interval ($e-b = 8$)

		Scaled by beginning market value ^a						Scaled by absolute value of EVC ^c	
		France 50	Germany 51	UK 48	US 48	All four ^b 197	France 50	Germany 51	UK 48
GM	N	0.0000	0.0000	0.0842	0.6095	0.0000	0.0000	0.0360	0.2540
	Mean	0.0000	0.0000	0.0000	0.0000	0.007	0.0000	0.0000	0.0000
	Median	0.0000	0.0000	0.0000	0.0000				0.007
Pairs ^c :	France								
Germany		1.000	0.307	0.020			1.000	0.307	0.020
UK			0.303	0.019			0.303	0.019	0.095
GW+GM	N	0.0992	0.1091	1.9310	0.6095	<0.001	0.0588	1.4545	23.4693
	Mean	0.0000	0.0036	0.1335	0.0000		0.0000	0.0042	0.0886
	Median	0.0000	0.0000						0.0000
Pairs ^c :	France		0.001	<0.001	0.515			<0.001	<0.001
Germany			<0.001	<0.001	<0.001			<0.001	<0.001
UK				<0.001					<0.001
AR	N	0.0024	0.0000	0.2155	0.0000	<0.001	0.0017	0.0000	0.0000
	Mean	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000
	Median	0.0000	0.0000						<0.001
Pairs ^c :	France		0.011	<0.001	0.014			0.011	<0.001
Germany			<0.001	1.000	<0.001			<0.001	1.000
UK					<0.001				<0.001
PY _A	N	0.0004	0.0013	0.0648	0.0085	<0.001	0.0002	0.0094	0.0261
	Mean	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000
	Median	0.0000	0.0000						<0.001
Pairs ^c :	France								
Germany		1.000	<0.001	0.2776			1.000	<0.001	0.286
UK			<0.001	0.2777			<0.001	0.295	0.001

Table 3 (continued)

OTH	Mean	0.0778	0.1281	0.0921	0.1331	0.031	0.014	0.0594	1.0217	4.1767	0.7992
	Median	0.0257	0.0184	0.0185	0.0031			0.0261	0.0383	0.0086	0.0034
Pairs: France				0.373	0.538	0.001			0.656	0.045	0.001
Germany					0.883	0.053			0.084		0.005
UK						0.012					0.071

Notes to Table 3

a. This table reports mean and median absolute values of differences between EVC measures over the interval from b to e , calculated exclusive of dirty surplus flows and denoted $EVC_{DS,e}^b$ and the correct EVC measure denoted EVC_e^b , as given by equation (7) in the text:

$$(7) \quad EVC_{DS,e}^b - EVC_e^b = - \left(\sum_{s=1}^{e-b-1} DS_{b+s} \prod_{t=s+1}^{e-b+i} (1 + r_{b+t+k}) + DS_e \right).$$

Panel A reports these errors for three-year measurement intervals ($e-b=3$); Panel B reports these errors for eight-year measurement intervals ($e-b=8$). The absolute values of errors in measurement of EVC are scaled both by market value at the start of the measurement interval (left side of each panel) and by the absolute value of the correct EVC measure (right side of each panel). The various dirty surplus-based measures differ from each other with respect to the classes of dirty surplus flow that are omitted. Details are as follows:

- ALL: all dirty surplus flows are omitted;
- GW: goodwill only is omitted;
- GM: the unrecognised issue of equity under merger (pooling-of-interests) accounting only is omitted;
- GW+GM: both goodwill and the unrecognised issue of equity under merger (pooling-of-interests) accounting are omitted;
- AR: asset revaluations only are omitted;
- PYA: prior-year adjustments only are omitted;
- OTH: 'other dirty surplus flows' only are omitted.

b. Probability value for a Kruskal-Wallis test of the null hypothesis of equality of mean rank in absolute errors across all four countries. Probability values of 0.05 (5%) or less are printed in bold type.

c. Probability value for a Kruskal-Wallis test of the null hypothesis of equality of mean rank in absolute errors across pairs of countries. Probability values of 0.05 (5%) or less are printed in bold type.

Table 4
Descriptive statistics for variables used in regression tests

Item (scaled by beginning-of-interval book value)	Total observations	Mean	Min.	25th percentile	Median	75th percentile	Max.
<i>All countries</i>							
Beginning-of-interval market value	667	2.65	0.10	1.05	1.73	3.15	19.94
Present value of future dirty surplus residual income	667	0.00	-3.70	-0.20	0.00	0.23	3.19
Present value of future dirty surplus flows	667	-0.04	-1.99	-0.03	0.00	0.01	0.66
Present value of horizon value	667	1.74	-2.43	0.03	0.62	2.10	21.93
<i>France</i>							
Beginning-of-interval market value	168	1.95	0.13	0.96	1.51	2.40	9.61
Present value of future dirty surplus residual income	168	0.02	-1.65	-0.14	0.14	0.20	1.76
Present value of future dirty surplus flows	168	0.00	-0.47	-0.13	0.00	0.18	0.39
Present value of horizon value	168	1.51	-1.42	0.07	0.55	2.05	18.77
<i>Germany</i>							
Beginning-of-interval market value	162	3.08	0.37	1.31	1.99	3.18	19.94
Present value of future dirty surplus residual income	162	0.00	-1.59	-0.18	-0.02	0.17	2.40
Present value of future dirty surplus flows	162	-0.03	-0.60	-0.04	0.00	0.00	0.66
Present value of horizon value	162	1.73	-0.76	0.13	0.66	1.73	19.86
<i>UK</i>							
Beginning-of-interval market value	170	2.38	0.10	0.79	1.47	3.04	12.94
Present value of future dirty surplus residual income	170	-0.02	-4.13	-0.23	-0.07	0.23	3.14
Present value of future dirty surplus flows	170	-0.16	-8.07	-0.10	0.00	0.04	2.17
Present value of horizon value	170	1.87	-2.43	-0.13	0.25	2.00	21.07
<i>US</i>							
Beginning-of-interval market value	171	3.50	0.15	1.38	1.94	3.58	24.93
Present value of future dirty surplus residual income	171	-0.13	-6.26	-0.38	0.05	0.30	3.85
Present value of future dirty surplus flows	171	-0.03	-1.99	-0.01	0.00	0.00	2.04
Present value of horizon value	171	2.34	-0.91	0.25	0.91	2.60	30.37

Note to Table 4

This Table reports descriptive statistics for the variables used in our regression models, after elimination of cases in which book value at the start of the measurement interval is negative and cases in which one or more of the regression variables falls in the most extreme 2% of the distribution for that variable. Because extreme observations are not uniformly distributed across countries, deletion of the 2% most extreme observations for single-country data causes some extreme cases that are trimmed from the pooled data to remain within the single-country data. For this reason, we also run our single-country regression tests after trimming cases in which one or more of the regression variables falls in the most extreme 4% of the distribution for that variable. This does not materially change our results (results not tabulated).

Table 5
Regression tests of the relationship between the market-to-book ratio and scaled components of three-year horizon perfect-foresight residual income value estimates

	Number of observations	Intercept	Present value of future dirty surplus residual income	Present value of future dirty surplus flows	Present value of horizon value	Adjusted R-squared
Panel A: All countries						
All explanatory variables	667	1.64 (5.93*)	-0.01 (-0.03)	0.11 (0.30)	0.59 (8.04*)	0.432
PV of DS residual income and PV of DS flows ^a	667	2.62 (15.34*)	1.01 (2.74*)	-0.86 (-1.63)		0.057
PV of DS residual income only ^a	667	2.66 (15.69*)	1.05 (2.83*)			0.054
PV of DS flows only ^a	667	2.61 (14.79*)	-1.15 (-2.11*)			0.008
PV of horizon value only ^a	667	1.64 (7.29*)		0.58 (10.12*)		0.434
Panel B: France						
All explanatory variables	168	1.41 (4.69*)	0.38 (1.00)	0.12 (0.08)	0.35 (7.12*)	0.415
PV of DS residual income and PV of DS flows ^a	168	1.91 (8.28*)	1.55 (3.92*)	0.69 (0.50)		0.137
PV of DS residual income only ^a	168	1.91 (8.20*)	1.55 (3.93*)			0.141
PV of DS flows only ^a	168	1.95 (7.86*)		0.91 (0.58)		-0.004
PV of horizon value only ^a	168	1.38 (4.60*)		0.38 (8.57*)		0.415

Table 5
Regression tests of the relationship between the market-to-book ratio and scaled components of three-year-horizon perfect-foresight residual income value estimates (continued)

	Number of observations	Intercept	Present value of future dirty surplus residual income	Present value of future dirty surplus flows	Present value of horizon value	Adjusted R-squared
Panel C: Germany						
All explanatory variables	162	1.43 (3.43*)	-1.05 (-1.88)	2.23 (1.76)	0.98 (10.31*)	0.742
PV of DS residual income and PV of DS flows ^a	162	3.13 (7.49*)	0.98 (0.85)	1.94 (1.06)		0.016
PV of DS residual income only ^a	162	3.07 (7.84*)	0.98 (0.84)			0.015
PV of DS flows only ^a	162	3.13 (7.49*)	1.94 (1.15)			0.001
PV of horizon value only ^a	162	1.47 (3.58*)		0.93 (8.31*)		
Panel D: UK						
All explanatory variables	170	1.64 (5.96*)	0.53 (2.41*)	0.95 (3.42*)	0.48 (10.78*)	0.603
PV of DS residual income and PV of DS flows ^a	170	2.39 (8.09*)	1.69 (4.32*)	-0.13 (-0.63)		0.226
PV of DS residual income only ^a	170	2.41 (8.42*)	1.67 (4.23*)			0.228
PV of DS flows only ^a	170		2.37 (7.07*)	-0.03 (-0.24)		-0.006
PV of horizon value only ^a	170		1.62 (4.94*)	0.41 (5.25*)		0.456

Table 5
Regression tests of the relationship between the market-to-book ratio and scaled components of three-year-horizon perfect-foresight residual income value estimates (continued)

	Number of observations	Intercept	Present value of future dirty surplus residual income	Present value of future dirty surplus flows	Present value of horizon value	Adjusted R-squared
Panel E: US						
All explanatory variables	171	1.95 (2.65*)	-0.69 (-0.96)	0.56 (1.51)	0.63 (3.87*)	0.310
PV of DS residual income and PV of DS flows ^a	171	3.50 (7.36*)	-0.07 (-0.08)	0.36 (0.68)		-0.011
PV of DS residual income only ^a	171	3.49 (7.40*)	-0.07 (-0.08)			-0.006
PV of DS flows only ^a	171	3.51 (7.46*)	0.36 (0.68)			-0.005
PV of horizon value only ^a	171	2.13 (3.55*)		0.59 (4.43*)		0.289

Notes to Table 5

a. PV denotes 'present value'. DS denotes 'dirty surplus'.

b. The regression model for which results are reported in the first row of each panel is as follows:

$$MTBR_{b,i} = \alpha_0 + \alpha_1 PDRIB_{b,i}^e + \alpha_2 PTDSFB_{b,i}^e + \alpha_3 PHVB_{e,i} + \varepsilon_{b,i}$$

where $MTBR_{b,i}$ is the market-to-book ratio for company i at time b , $PDRIB_{b,i}^e$ is the present value at time b of dirty surplus residual incomes arising up to the horizon e , scaled by book value at time b , $PTDSFB_{b,i}^e$ is the present value at time b of total dirty surplus flows arising up to the same horizon, scaled by book value at time b , $PHVB_{e,i}$ is the present value at time b of the market-to-book premium at horizon e , scaled by book value at time b , α_0 , α_1 , α_2 and α_3 are regression coefficients, and $\varepsilon_{b,i}$ is an error term. The horizon length ($e-b$) is three years in all cases. Within each panel, the first row reports the results of the full regression model with all three explanatory variables. The second row reports the results of a regression of $MTBR_{b,i}$ on the dirty surplus residual income term and the dirty surplus flow term only. The third, fourth and fifth rows of each panel report the results of a regression of $MTBR_{b,i}$ on each of the explanatory variables individually. The regression models are run (i) for the pooled data for France, Germany, UK and US (Panel A) and (ii) for each country separately (Panels B, C, D and E, respectively).

c. t -statistics are given in parentheses beneath the regression coefficients. These are calculated using the heteroskedasticity-consistent covariance matrix estimator as proposed by White (1980). In the cases of α_1 , α_2 and α_3 , the t -statistics are in respect of a two-sided test of the null hypothesis that the regression coefficient is zero. In the case of α_0 (the regression intercept coefficient) for the multivariate regression, the t -statistics are in respect of a two-sided test of the null hypothesis that the intercept coefficient is equal to its theoretical value of one. This convention is also applied in the case of the t -statistics for the regression intercept coefficients of the other regression models. * indicates that the coefficient is significantly different from its hypothesised value at the 5% level.

d. The data used in the regression models are those used in the tests reported in Tables 2 and 3 except that, for the overall data set and for each country, we eliminate cases in which book value at time b is negative and cases in which one or more of the regression variables falls in the most extreme 2% of the distribution for that variable.

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Review of 'Dirty surplus accounting flows: international evidence'

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The paper presented at the Cass Conference by John O'Hanlon, 'The effect of omitting dirty surplus flows from residual income value estimates: international evidence', seeks to contribute to the debate on the desirability of dirty-surplus accounting. Standard setters and accounting academics have been increasingly concerned about a relative lack of transparency of dirty surplus accounting flows and its potential for earnings management (Brief. and Peasnell, 1996). There is, however, surprisingly little empirical research on both the relative magnitude of dirty surplus accounting flows and its impact. The paper reviewed documents the magnitude of aggregate dirty surplus flows relative to aggregate net income for French, German, UK and US companies. It examines the effect of the omission of various dirty surplus flows in creating bias and inaccuracy in perfect-foresight residual income valuation estimates with respect to clean-surplus estimates and observed market values.

The magnitude of aggregate dirty surplus flows relative to aggregate net income is shown to vary substantially across countries and regimes. Exclusive of merger accounting items, it is highest for continental European companies. Inclusive of merger accounting items, it is highest for US companies. Bias caused by the omission of various dirty surplus flows in perfect-foresight residual income valuation estimates with respect to clean surplus estimates is shown to be limited to goodwill-related flows. Inaccuracy caused by the omission of various dirty surplus flows is shown to be substantial for all types of dirty surplus flows. However, there is no evidence that clean surplus-based formulations are superior to dirty surplus-based formulations as far as bias and inaccuracy with respect to observed market values are concerned.

The paper presented at the Cass Conference clearly contributes to our understanding on dirty surplus accounting flows. Conference participants however felt that the paper would benefit from a change in focus away from valuation with perfect foresight:

1. The descriptive statistics provided on the relative magnitude of aggregate dirty surplus flows relative to aggregate net income obtaining across countries and regimes are interesting in their own right especially in the light of scarce prior empirical research in this area.¹
2. The use of realisations as proxies for expectations over long intervals in the residual income valuation model is problematic.
3. The motivation for assessing the magnitude of the bias and inaccuracy in valuation caused by the omission of various dirty surplus flows in perfect-foresight residual income valuation estimates with respect to clean surplus estimates is not straightforward. Any financial analyst valuing any stock on the basis of a residual income valuation model should be able to determine expectations of future residual income which are fully consistent with clean surplus accounting regardless of the relative magnitude of dirty surplus flows relative to net income in past and present financial statements. There would not appear to be any incremental cost to the analyst when building expectations of future residual income that are fully consistent with clean surplus accounting (analysts only have to recognise in the P&L statement any economic resource generated or consumed during the financial year recognised in the balance sheet). Why should any rational analyst work on the basis of a flawed model implementation when

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¹ These results are, however, sensitive to economic factors characterising the period covered by the data, 1993–2000, which is not that long: e.g. absence or presence of a M&A wave, low or high volatility in international currencies.

there is no incremental cost in working on the basis of the correct model specification?

Given the focus of the paper, the paper presented at the conference would also benefit from:

1. A more sophisticated estimation of discount rates in residual income and residual income valuation estimates. The paper assumes a constant equity risk premium, and a constant cost of capital, across stocks and countries.
2. A discussion of econometric issues associated with the use of realisations as proxies for expectations.
3. The use of nested tests, which would enable the authors to determine the incremental ability of residual income valuations based on clean surplus accounting (compared with residual income valuations omitting dirty surplus flows) to explain cross-sectional variations in contemporaneous stock prices.
4. More details on the difficulties faced in classifying the dirty surplus accounting flows.

The revised paper, 'Dirty surplus accounting flows: international evidence', addresses most of the issues raised at the conference. The revised paper:

1. Gives more prominence to the descriptive statistics on the relative magnitude of dirty surplus flows relative to net income.
2. Shifts the focus away from forward-looking valuation towards ex-post performance measurement based on the concept of excess value created (O'Hanlon and Peasnell, (2002)). The shift in the paper's focus is furthermore reflected in the change in the paper's title.
3. Provides tests aimed at measuring the incremental power of dirty surplus flows for market values beyond clean surplus residual incomes.
4. Reports that the results are robust to risk premia varying across industries and countries.
5. Includes a caveat regarding the use of realisations as proxies for expectations.

The results of the ex-post performance tests introduced in the revised paper are similar to the results

² According to Ou and Penman (1989), 'Fundamental analysis maintains that firms' values are indicated by information in financial statements. However, the methods by which these values are extracted from financial statements are unclear. Traditional financial statement analysis provides little guidance for this task'.

of the valuation tests. Bias caused by the omission of various dirty surplus flows with respect to clean surplus estimates is shown to be limited to goodwill-related flows. Inaccuracy caused by the omission of various dirty surplus flows is shown to be substantial for all types of dirty surplus flows. Dirty surplus flows, however, have little explanation power for book-to-market ratios.

The focus on ex-post performance measurement avoids the prior problems associated with the use of realisations as proxies for expectations. It is nevertheless still difficult to understand why any rational analyst would wish to work on the basis of a flawed model implementation (caused by the omission of various dirty surplus flows) when there is no incremental cost in working on the basis of the correct model specification.

This paper not only contributes to our understanding on dirty surplus accounting flows, but also raises interesting questions in the context of the debate on the desirability of dirty surplus accounting; as recognised on p.384: 'Dirty surplus flows and complex capital transactions are sometimes disclosed opaque in financial statements'.

1. Are dirty surplus flows more opaque than clean surplus flows?
2. Does opacity in dirty surplus accounting lead to bias in expectations of value relevant flows such as residual income, free cash flows, or dividends? If so, opacity in dirty surplus accounting could cause systematic valuation errors.
3. Is it possible to trade successfully on the basis of the relative magnitude and nature of dirty surplus accounting flows (as reported for accruals in Sloan, 1996 and Teoh et al., 1998)? Furthermore, there is little published empirical research as to how analysts do value stocks and the extent to which they rely on residual income models.²

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Book reviews

Auditor Resignations and Dismissals in the UK.

Peter Moizer and Brenda Porter. Institute of Chartered Accountants in England and Wales, London, 2004. vi+111pp.

In 1989, a change to UK company law required outgoing audit firms to state whether any circumstances connected with their ceasing to hold office should be brought to the attention of shareholders or creditors of the company. When outgoing audit firms consider such circumstances exist, they are required to file statements of circumstances at Companies House. This research report by professors Peter Moizer and Brenda Porter investigates the filing of statements for all auditor changes involving UK listed companies during the 1990s. The research is important because it goes to the heart of auditors' responsibilities toward financial statement users and the effectiveness of regulation of the auditing profession.

Chapter 2 comprehensively summarises extant academic research on auditor changes. Studies have primarily examined auditor changes in the US because US companies are required to disclose a lot more information than UK companies. US companies are required to disclose in 8-K forms: (a) who initiated the auditor change (the company or the audit firm), (b) whether the change was approved by the board of directors or the audit committee, and (c) whether there were any reportable events or disagreements with the outgoing audit firm. US companies file 8-K forms with the SEC within five working days of the decision to change auditor and the SEC requires the outgoing audit firm to confirm whether it agrees with the company's 8-K disclosure. Extant US studies show the required auditor change disclosures provide valuable information to shareholders.

UK companies are required to disclose very little information about auditor changes, and their disclosures are not timely. Often the auditor change is first disclosed in the annual report audited by the incoming audit firm. Even then, there is no requirement to disclose when the auditor change occurred, who initiated the change, whether the change was approved by an audit committee, or whether there were reportable events or disagreements with outgoing audit firms. Financial statements users in the UK therefore have very little information with which to evaluate

why auditor changes occur.

Chapter 3 provides evidence on 609 auditor changes involving listed UK companies in the 1990s. Consistent with extant research, the authors find auditor change companies have above average levels of risk and are more likely to receive qualified audit opinions (both from outgoing audit firms and incoming audit firms).

Chapter 4 discusses the evolution of UK company law regarding auditor changes. An important conclusion is that changes in company law occur *after* problems have already occurred; the law is rarely changed to prevent problems from occurring in the first place. To determine the effectiveness of the 1989 change to company law, the authors search Company House records for statements relating to the 609 auditor changes. The number of statements of circumstances filed by outgoing audit firms was found to be just *seven*. This is a remarkably small number, especially when one considers that 35 companies received qualified opinions from incoming audit firms and an additional 11 companies received unqualified opinions with explanatory paragraphs.

Although the authors are careful not to rule out the possibility that few outgoing audit firms had information that should have been disclosed, US evidence indicates this possibility is unlikely (US companies often disclose reportable events or disagreements with outgoing audit firms). We are therefore left with one of two possibilities. Either UK companies are much less likely to have reportable events or disagreements compared to US companies, or outgoing UK audit firms systematically under-disclose problems in their statements of circumstances.

In my view, it is difficult to avoid concluding that the latter explanation is most likely. The authors find only two of the seven statements disclosed meaningful information about disagreements between clients and outgoing audit firms. In the first statement, the outgoing audit firm (BDO Stoy Hayward) noted a lack of appropriate financial controls at Bircham International Plc. In the second statement, the outgoing audit firm (PwC) revealed a disagreement with Jarvis plc regarding the audit fee. The authors interview senior audit partners to find out why so few statements of circumstances were filed by outgoing audit firms. An

important explanation is that audit partners were concerned about the risk of legal action if they made statements that turned out to be erroneous.

Chapter 5 provides rich detail about PwC's resignation from Jarvis. PwC's statement of circumstances resulted in a legal dispute which was eventually settled in PwC's favor. PwC had tried to charge a higher fee because of the extra work it needed to perform following the aggressive accounting adopted by Jarvis on its long-term contracts. PwC subsequently resigned after Jarvis objected to the higher fee. The authors show Jarvis failed to disclose timely information to investors about PwC's resignation, Jarvis briefed *The Financial Times* with misleading information about PwC's resignation, and Jarvis tried to prevent PwC from depositing its statement of circumstances with Companies House. Investors found out about PwC's resignation 55 days after it occurred, only because of the detective work of an engineering journalist.

The authors are to be commended for producing a well-written and important research report. It is hoped that policy-makers respond by requiring companies and audit firms to provide comprehensive and informative disclosures about auditor changes. The UK is clearly a long way behind the US in this respect. Unfortunately, history suggests that UK audit regulation may change only when policy-makers are forced to respond to a serious audit scandal.

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Corporate Intangibles, Value Relevance and Disclosure Content. John Holland. Institute of Chartered Accountants of Scotland, Edinburgh, 2004. v+119pp. £15.

This ICAS research report consists of six chapters in which the author describes his research into the highly topical issue of intangible assets. The words 'value relevance' in the title are likely to attract researchers in the area of market-based accounting. This research is not within that tradition but is of a qualitative nature and based on a grounded theory model of disclosure. The author provides some criticism of market based accounting research as he considers it defines value relevance in a specific unchanging way whereas companies supply value relevant information 'in a partial changing, transient, holistic and negotiated sense'.

Chapter 1 contains a survey of the policy debate surrounding the issue of corporate intangibles and their disclosure. The author considers that there have been changes in value-creation within companies along with an increased use of knowledge-intensive assets. Capital markets will suffer if the information provided about intangibles is of poor

quality.

Chapter 2 briefly describes the research methods that consisted of interviews with company directors supplemented by examination of archival data. One particular achievement is that 23 out of 25 of the companies had been interviewed previously by the author in the period 1993 to 1997. This is possibly a unique feature of the study.

Chapter 3 presents the author's findings about the value-creation process. He identifies three value-creation processes: hierarchical, 'horizontal' and network value-creation. A diagrammatic model is then presented which links the four main value-drivers and the value creation processes to an informal disclosure agenda. This chapter concentrates more on the management aspects and Chapter 4 moves on to look at disclosure of the value-creation story in more detail. The author stresses the word 'story' in this chapter and considers the nature of value-creation stories, their dynamic aspects and problems. After presenting these findings, the author relates his 'story' concept to the disclosure and valuation crises observed in the financial markets in the period 1997–2003. He concludes that major failures have occurred in the market for information and that corporate stories need stringent reality checks.

The next chapter presents further results from the research relating to corporate perceptions of market valuation processes and the information needs of market participants. A diagrammatic model shows how changes in the capital market lead to changes in the market for information. This leads to new questions from analysts and fund managers and the company then changes its perception of what is value relevant information and what should be disclosed. The author reports that in the 1997–2000 period the 'new economy value-creation story' prevailed and the market 'abandoned information on corporate fundamentals and with it the conventional disclosure protocol'. However, this situation reversed in April 2000 and old economy companies became more attractive to fund managers.

Finally, the author discusses the policy implications arising from his findings. He proposes new disclosure guidance from policy makers to overcome disclosure problems associated with intangibles. In particular he suggests that financial statements should contain 'structured and routine value-creation information expressed as a story'. This will help to achieve a 'level playing field' for all investors. The proposals are supported by reference to linked work carried out by Lev (2001) on the 'value chain scoreboard' and the OFR proposals in the UK. He then suggests some supporting changes in the UK's current regulatory arrangements. Not everyone will react with delight to these suggestions in view of the vast increase in

disclosures that have already been mandated in recent years, along with the frequent changes in regulatory arrangements that have occurred.

In the academic literature, Bodoff and Zhang (2003) point out that there is a vast literature showing that the benefits of more, or more widespread, disclosure in order to level the playing field, are far from straightforward. They note that this literature is mathematical and thus rather inaccessible. They then go on to show mathematically that the US Securities and Exchange Commissions' EDGAR on the Internet (EOI) initiative does not benefit all investors and some investors are hurt by EOI. There is scope for an interesting debate between researchers taking a more qualitative approach to disclosure issues and the mathematical modellers.

Overall this is an interesting, well-written study that will be of relevance to other researchers in related areas, quoted company management, fund managers and analysts. In particular, it may provide valuable insights to those researchers making use of quantitative techniques to investigate value relevance within the market-based accounting research tradition.

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Towards the 'Great Desideratum': The Unification of the Accountancy Bodies in England, 1870–1880. Stephen P. Walker. The Institute of Chartered Accountants of Scotland, Edinburgh, 2004. xiv+328pp. £15.

The establishment of the Institute of Chartered Accountants in England and Wales (ICAEW) in 1880 was one of the most important events in the history of the accountancy profession, not only within the British Isles but also worldwide. In retrospect it may seem inevitable that the Incorporated Society of Liverpool Accountants, the Institute of Accountants in London, the Manchester Institute of Accountants, the Society of Accountants in England, and the Sheffield Institute of Accountants, all formed in the 1870s, should amalgamate into one body, but a glance northwards across the border suggests otherwise. It took nearly a century for the three chartered bodies in Edinburgh, Glasgow and Aberdeen to come together as the Institute of Chartered Accountants of Scotland (ICAS). It is the research committee of ICAS that has sponsored the volume under the review which, as its convener, Nigel Macdonald, puts it in his foreword, covers the foundation of

ICAS's 'younger, but much larger, sister body'.

Stephen Walker, who has already authored and co-authored several good books on the history of the accountancy profession, has written an excellent narrative account of the process of unification. His book is accessible to all who are interested in the subject. For those who need a more theoretical but less readable approach he has also contributed an article to *Accounting, Organizations and Society*, vol. 29 (2) (2004). A great strength of the book is the variety of the sources that have been used. These include the archives of the predecessor bodies (except those of the Society of Accountants in England which have not been located); local and national newspapers; professional journals (not just *The Accountant* but also legal journals); parliamentary papers; Hansard; and contemporary books and pamphlets.

Since 1880, the ICAEW has always been both the most prestigious and the largest body of accountants within England and Wales. As Peter Boys (*Accounting, Business & Financial History*, vol. 14(1), 2004) has recently shown, the ICAEW had 600 members in 1880; in 2004 it has over 125,000. One of its great strengths has been its ability successfully to combine exclusivity with growth. However there has always been tension between the two. Notions of exclusivity were there from the start. Walker demonstrates the unwillingness of the City of London accountants who founded the London Institute to co-operate with those in the provinces whom they clearly considered to be lesser mortals. Nor were they much interested in increasing their London membership. The 134 members in 1871 grew only to 178 by 1879. Fortunately there were some strong characters in the provinces, especially in Lancashire, who were more growth minded. Moreover, there were leading accountants who had not joined any of the existing organisations. These included Edwin Guthrie and Charles Wade in Manchester who founded the Accountants' Incorporation Association in order not only to become founder members of the new Institute but also members of its first Council.

Walker shows how members of the integrated Institute nearly did not become 'chartered' accountants. Designations considered during the negotiations for amalgamation and government recognition included 'official', 'professional', 'sworn' and 'incorporated' accountants. In the event the founders of the ICAEW were able to use the chartered name and designation and even to improve upon the Scottish precedent. There were chartered accountants in Scotland from the mid 1850s but there was no Institute of Chartered Accountants of Scotland until 1951. Members of the ICAEW are often referred to as English rather than English and Welsh chartered accountants.

None of the predecessor bodies was based in Wales, and Walker, although now a professor at the University of Wales, does not provide an explanation.

What were the most significant factors that encouraged and brought about unification? Walker argues for the following:

- a widespread desire for organisational change;
- compelling external stimuli in the form of threats to the profession;
- alignment of unification with the public interest;
- circumstances compelling a retreat from an exclusive concept of professional boundaries.

As we all know, the unification of 1880 was not the end of the story. There were still, and always seem to be, accountants with varying amounts of skill and experience who feel excluded. The problems, successes and failures of coordination and integration within the British profession between 1930 and 1970 have been explored in two monographs by Shackleton and Walker published by ICAS in 1998 and 2001. Even as I write this review, plans are announced to integrate the ICAEW with the Chartered Institute of Management Accountants and the Chartered Institute of Public Finance and Accountancy. It is a never-ending story.

I strongly recommend this book, with only two grumbles. The main title is likely to deter rather than attract potential readers, and the lack of an index makes the book much harder to consult than it need be.

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AUDITQUAL: Dimensions of Audit Quality.
Angus Duff. Institute of Chartered Accountants of Scotland, Edinburgh, 2004. v+141pp. £15.

Duff aims to develop and to empirically test an audit quality model. The salient characteristic of this model is that it identifies the importance of audit quality characteristics as perceived by various market participants.

As audit quality is unobservable, there has been limited empirical research on it as a topic. The difficulty in audit quality research also lies in the fact that there is no consensus on what it actually means. What constitutes audit quality is subjective and dependent on the perception of various market participants involved. In the academic literature, audit quality is often defined as the joint ability of an auditor to detect fraud and to report the fraud.

This definition focuses on the technical competence and independence of an auditor. Duff argues that this traditional definition has not fully captured the potential conflicting roles of the various audit market participants, namely, external statement users (fund managers), audit clients and audi-

tors. For example, the definition ignores the importance of auditor-client relationship as an attribute of audit quality. Duff widens the traditional definition of audit quality. He considers that both technical quality and service quality are important dimensions of audit quality. Technical quality focuses on the technical constructs of competence (and includes independence), while service quality addresses issues pertinent to audit clients such as responsiveness to client needs (and includes consultancy services).

Duff begins by proposing a model of audit quality which provides a conceptual foundation for understanding quality from the perspective of audit, audit client and other stakeholders. The model identifies many 'gaps', among and within the various market participants, in the understanding of characteristics of audit quality (p.59). While it is to be expected that there are differences between audit client and audit firm on the perception of audit quality characteristics, it is interesting that Duff points out that differences also exist within audit firms and within client firms. For an audit firm, what an audit firm draws up regarding its quality standard, what the firm promises to its clients and what a firm actually delivers can all be different. The differences arise because different parties are involved and they have different perceptions of the nature of audit quality. The same applies to the individual client firm with regards to audit quality. There can be a gap between the expectations of client / stakeholders and their perceptions of the quality of audit service received.

Duff then analyses 20 auditors' external communication; that is, what audit firms promise to their potential clients. He scrutinises audit firm annual reports and reviews, marketing materials and advertisements found on audit firm websites. There is evidence that audit firms places emphasis on their service quality rather than technical quality. Duff then further identifies nine key dimensions of audit quality. The dimensions of technical quality are auditor reputation, capability (competence of audit team staff), independence, expertise (market share by audit firm) and experience (experience of audit manager). The dimensions of service quality include responsiveness (willingness to provide detailed cost information), empathy (the engagement partner is pro-active and contributory), client service (conducts client service reviews) and non-audit services. Questionnaires were sent to audit firm partners, finance directors and fund managers: 102 usable responses were obtained from audit partners, 68 from finance directors and 74 from fund managers. Among the audit partners, there is a high level of consensus of the relative importance of reputation and capability dimensions.

It is interesting that independence is considered as a relatively less important audit quality charac-

teristic. The non-audit services characteristic appear to be the least important in determining audit quality. Similar results are obtained from finance directors and fund managers. There is evidence that fund managers place more importance on technical quality than service quality. The author explains that 'external users of accounting information are less likely to be interested in service quality issues between the auditor and their client'. (p.105)

To conclude, Duff provides stimulating thoughts about perceptions of audit quality. Different market participants may have different views on what

constitutes audit quality. The model developed by Duff provides a useful basis for further investigations, both empirical and theoretical, on dimensions of audit quality. The model can also be further developed. For example, there appears to be little differentiation between company management and shareholders in the model. In addition, in the audit quality model, the importance of the gap between clients' perception of audit quality received and auditors' perception of what they have delivered, seems to have been ignored.

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Chris Pong

**17th Annual Conference on
Accounting, Business & Financial History
at Cardiff Business School 15–16 September 2005
Announcement of Conference and Call for Papers**

Guest Speaker – Warwick Funnell

Theoretical, empirical and review papers are welcomed in all areas of accounting, business and financial history.

The conference provides delegates with the opportunity of presenting and discussing in an informal setting, papers ranging from early working drafts to fully developed manuscripts. The format of the conference allows approximately 40 minutes for presentation and discussion in order to help achieve worthwhile feedback from attending.

In the past, many papers presented at Cardiff have subsequently appeared in *Accounting, Business and Financial History*, edited by John Richard Edwards and Trevor Boyns, or in another of the full range of international, refereed academic accounting, business and economic history journals.

The conference will be held at Aberdare Hall, Cathays Park, Cardiff, CF14 3UJ, from lunchtime on Thursday, 15 September 2005 to mid-afternoon on Friday, 16 September 2005.

The fully inclusive conference fee (covering all meals, the conference dinner on Thursday and accommodation) is £120.

Those wishing to offer papers to be considered for presentation at the conference should send an abstract of their paper (not exceeding one page) by 31 May 2005 to:

Debbie Harris, Cardiff Business School, Colum Drive, Cardiff, CF11 3XG.
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Following the refereeing process, applicants will be advised of the conference organisers' decision on 30 June 2005.

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Presentation

A cover page should show the title of the paper, the author's name, title and affiliation, and any acknowledgements. The title of the paper, but not the author's name, should appear on the first page of the text. An abstract of 150–250 words should be provided on a separate page immediately preceding the text. Section headings should be numbered using Arabic numerals.

Tables and figures

Each table and figure should bear an Arabic number and a title and should be referred to in the text. Sources should be clearly stated. Sufficient details should be provided in the heading and body of each table and figure to reduce to a minimum the need for cross-referencing by readers to other parts of the manuscript. Tables and figures should appear at the end of the paper, with its most appropriate placing noted in the paper itself. Diagrams and charts should be submitted in camera-ready form.

Footnotes

Footnotes should be used only in order to avoid interrupting the continuity of the text, and should not be used to excess. They should be numbered consecutively throughout the manuscript with superscript Arabic numerals. They should not be used in book reviews.

References

References should be listed at the end of the paper and referred to in the text as, for example, (Zeff, 1980: 24). Wherever appropriate, the reference should include a page or chapter number in the journal or book in question. Only works cited in the paper should be included in the list. Citations to institutional works should if possible employ acronyms or short titles. If an author's name is mentioned in the text it need not be repeated in the citation, e.g. 'Tippett and Whittington (1995: 209) state...'

In the list of references, titles of journals should omit an initial 'The' but should not otherwise be abbreviated. The entries should be arranged in alphabetical order by surname of the first author. Multiple works by the same author should be listed in chronological order of publication, e.g.:

- Accounting Standards Steering Committee (1975). *The Corporate Report*. London: ASC.
Tippett, M. and Whittington, G. (1995). 'An empirical evaluation of an induced theory of financial ratios'. *Accounting and Business Research*, 25: 208–218.
Watts, R. L. and Zimmerman, J. L. (1986). *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Style and spelling

Abbreviations of institutional names should be written as, for example, FASB and not F.A.S.B.; those of Latin terms should contain stops (thus i.e. not ie). Words such as 'realise' should be spelled with an 's' not a 'z'. Single quotation marks should be used, not double.

Mathematical notation

Mathematical notation should be used only where it adds rigour and precision, and should be properly explained in the text. Equations should be numbered in parentheses, flush with the right-hand margin.

